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THE AMERICAN FARM ECONOMIC ASSOCIATION

MEETING JOINTLY WITH

THE WESTERN FARM ECONOMICS ASSOCIATION

AUGUST 26-29, 1956, ASILOMAR, CALIFORNIA

THE AMERICAN FARM ECONOMIC ASSOCIATION
Volume XXXVIII DECEMBER, 1956 Number 5

THE AMERICAN
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JOURNAL OF FARM ECONOMICS

December 1956

CONTENTS

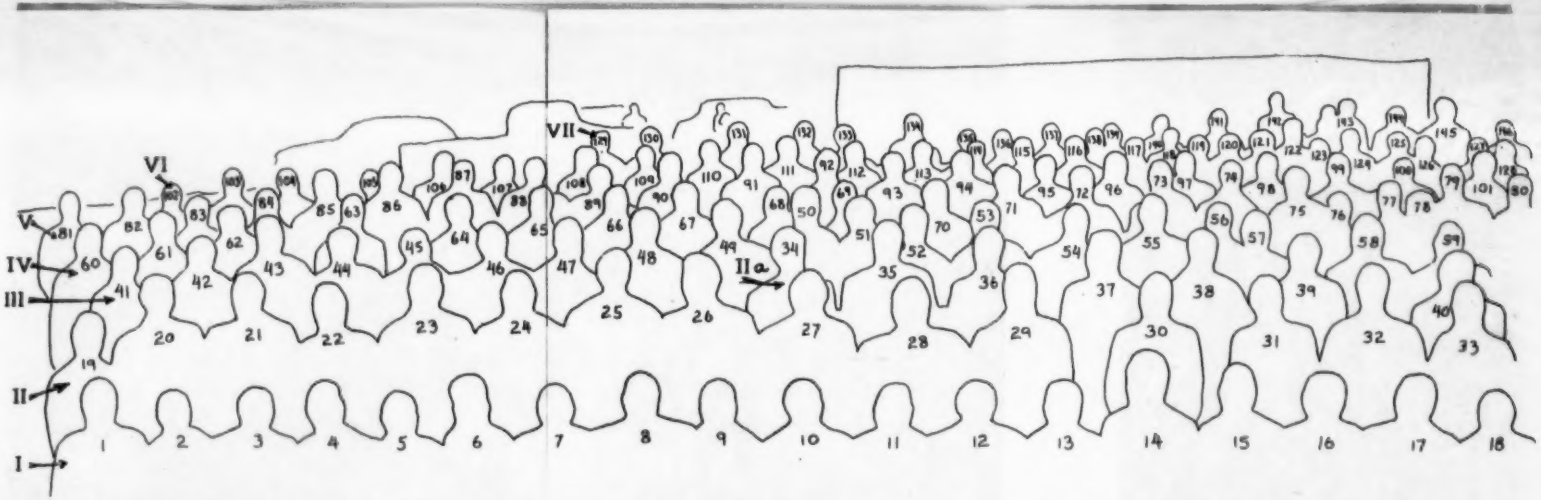
Agricultural Economics in the Years Ahead ..... *H. B. James* 1093
The Agricultural Problem ..... *Jesse W. Tapp* 1102
California Agriculture—Its Unique Features and Problems ..... *J. Earl Coke* 1107
A Prevue of California Agriculture ..... *A. D. Reed* 1115
The Economics of Growth and Stability in the United States
Growth and Stability in the General Economy ..... *Solomon Fabricant* 1127
An Alternative Diagnosis of the Farm Problem ..... *Theodore W. Schultz* 1137
Discussion ..... *E. J. Working* 1152
The Strategy for Economic Growth and Stability
Policies for Economic Growth and Stability ..... *Herbert Stein* 1159
Panel Discussion: "Strategy from the Standpoint of Agriculture" 1173
United States Technical Assistance to Foreign Agriculture
A Review and Criticism of United States Participation in Agricultural Programs of Technical Cooperation ..... *A. T. Mosher* 1197
Area Section A. Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan) 1212
Area Section B. Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan) 1216
Area Section C. Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East) 1228
Effective Cooperation with Agricultural Economists Abroad 1235
Growing Demand for Water: Product and Cost Allocation
Theoretical Considerations of Water Allocation Among Competing Uses and Users ..... *John F. Timmons* 1244
Can Water Be Allocated by Competitive Prices? ..... *W. K. McPherson* 1259
Economic Implications of the Partnership Policy in Water Resources Development ..... *Roy E. Huffman* 1269
Discussion ..... *Irving F. Davis, Jr.* 1276
Discussion ..... *Raleigh Barlowe* 1279
Discussion ..... *Kristjan Kristjanson* 1282
The Role of Farm Management Research in the United States: 1956-66
A Framework for Farm Management Research Programs in the Decade Ahead ..... *Earl W. Kehrberg* 1285
Institutional Consideration in Farm Management in the Decade Ahead ..... *Sydney D. Staniforth* 1293
Policy Considerations in Farm Management Research in the Decade Ahead ..... *S. V. Ciriacy-Wantrup* 1301
Discussion ..... *E. N. Castle* 1311
Discussion ..... *Garland P. Wood* 1315
Discussion ..... *Andrew Vanvig* 1318
Can We Expand Markets for Farm Products?
Economic Bases for Market Development Programs: The Case of United States Cotton ..... *M. K. Horne, Jr.* 1322
New Techniques in Consumer Preference Research ..... *Elmer R. Kiehl and V. James Rhodes* 1335
Research on Improved Merchandising of Agricultural Products ..... *Marshall R. Godwin* 1346
Discussion ..... *S. A. Robert, Jr.* 1354
Discussion ..... *James A. Bayton* 1357
Discussion ..... *Jerry Foytik* 1360

The Poor in Agriculture
Some Myths of Southern Economic Growth: A Study of Comparative Growth Rates in the Manufacturing Economy of the 11 Southeastern States ..... *Joe A. Martin* 1363
A Comparative Analysis of the Earnings of Some White and Negro Farmers in the United States ..... *J. W. Willett* 1375
What to Do about Low Incomes in Agriculture ..... *W. Elbert Hendrix* 1385
Discussion ..... *A. L. Larson* 1397
Discussion ..... *Leland G. Allbaugh* 1398
Discussion ..... *E. M. Morrison* 1401
Research Methods in Price Analysis
Demand and Quality Preferences for Deciduous Fruits ..... *A. H. Harrington and Conrad Gislason* 1405
Some Economic Effects of Supporting Feed Grain Prices ..... *Gordon A. King* 1415
New Ideas and Methods for Price Research ..... *Holbrook Working* 1427
Discussion ..... *Geoffrey Shepherd* 1437
Discussion ..... *L. L. Boger* 1441
Changing Requirements for Agricultural Data
Agricultural Data Requirements in Extension Work ..... *Dorris D. Brown and J. B. Claar* 1446
Data Requirements in Agricultural Administration and Research ..... *Marion D. Thomas* 1452
Local Data Requirements in Areas of High Agricultural Specialization ..... *E. C. Wilcox* 1455
Discussion ..... *George W. Westcott* 1468
Discussion ..... *J. A. Ewing* 1471
Award-Winning Graduate Students' Contributed Papers
Fiscal Needs and Capacity of Connecticut Towns ... *Dorothy C. Goodwin* 1475
Estimating Demand for Livestock Products at the Farm Level ..... *Elmer W. Learn* 1483
Economic Considerations in the Design and Evaluation of Production Forecasts ..... *Yair Mundlak* 1492
Linear Programming—A New Approach to Interregional Competition in Dairying ..... *Milton M. Snodgrass* 1501
Discussion ..... *Jarvis E. Miller* 1510
Discussion ..... *Richard Been* 1512
Credit and Investment in Agriculture
Economic Considerations in Making Timber Loans ..... *Eli Ferguson* 1516
Financing Farm Adjustments ..... *Fred L. Garlock* 1527
Equity Financing in Agriculture ..... *Frank Miller* 1537
Discussion ..... *Lawrence A. Jones* 1544
Discussion ..... *George K. Brinegar* 1547
Discussion ..... *Aaron G. Nelson* 1551
What Is Behind Widening Marketing Price Spreads?
Economic Implications of Current Transportation Policy Recommendations ..... *D. Philip Locklin* 1558
Salient Features of Rising Marketing Costs ..... *Kenneth E. Ogren* 1565
Alternate Approaches to the Marketing Margin—Farmer's Share Concept ..... *Frank M. Atchley* 1573
Discussion ..... *W. H. Thompson* 1585
Discussion ..... *Vincent I. West* 1589
Discussion ..... *R. J. Eggert* 1591
Contributions of Economics in Range Economics Research
Use of Economics in Making Decisions Relating to Range Use ..... *John A. Hopkin* 1594
Economic Concepts in Directing and Designing Research for Programming Use of Range Resources ..... *Earl O. Heady* 1604

Use of Surveys in Economic Research in Forage Production for Grazing ..... *C. V. Plath* 1617
Discussion ..... *George S. Tolley* 1626
Discussion ..... *C. B. Baker* 1630
Discussion ..... *Christoph Beringer* 1633
Regional Development and Trade
The Effects of Industrial Development on Tennessee Valley Agriculture, 1900-1950 ..... *William H. Nicholls* 1636
Price Support Programs and Interregional Competition ..... *Vernon L. Sorenson* 1650
Interregional Competition As Affected by Recent Developments ..... *Elroy Nelson* 1660
Discussion ..... *John D. Black* 1670
Discussion ..... *John L. Fisher* 1673
Discussion ..... *William E. Folz* 1675
Agricultural Policy Issues
Economic Implications of California Agricultural Marketing Programs ..... *Sidney Hoos* 1679
Canada's Price Support Policy and Its Performance ..... *A. H. Turner* 1692
Shortcomings in Current Explantions of National Farm Surpluses ..... *Don Paarlberg* 1708
Discussion ..... *Thurston M. Adams* 1716
Discussion ..... *Helen C. Farnsworth* 1719
Discussion ..... *George L. Mehren* 1723
Food Research
Major Current Problems in Nutrition Research ..... *Wendell H. Griffith* 1727
Studies of the Consumption of Food and Their Uses .. *Marguerite C. Burk* 1736
Some Problems Raised by the Official Estimates of American Per Capita Food Consumption ..... *M. K. Bennett* 1747
Discussion ..... *Jessie V. Coles* 1762
Discussion ..... *A. F. Wolf* 1765
Discussion ..... *Darrell F. Fienup* 1769
The Economic Impact of Technology on Farm Commodities
The Economic Impact of Technology on Meat Packing ..... *K. E. Miller* 1775
The Economic Impact of Technology on Farm Commodities: The Case of Oranges ..... *W. G. O'Regan* 1779
The Economic Impact of Technology on Strawberries .... *A. M. McDowell* 1785
Discussion ..... *Robert E. Branson* 1795
Discussion ..... *Willard D. Schutz* 1798
Discussion ..... *Robert C. Rock* 1801
Reports and Minutes
Annual Report of the President, AFEA 1804
Report of the Local Arrangements Committee for the 1955 Winter Meeting of AFEA, New York, December 28-30, 1955 1808
Report of the AFEA-WFEA Local Arrangements Committee, 1956 Annual Meeting 1810
Report of the Ladies' Hospitality Committee, 1956 AFEA-WFEA Meetings 1811
Annual Meeting Western Farm Economics Association 1814
Report of the Secretary-Treasurer, AFEA 1955-56 1817
Report of the Editor, *Journal of Farm Economics* 1820
Report of the Chairman, Awards Committee, AFEA 1821
Report of the Agricultural Data Committee of the AFEA 1826
Report of the Directory Committee, AFEA 1829
Report of the Committee on Recognition of Outstanding Agricultural Economists, AFEA 1831
Report of Committee on Financing Graduate Student Attendance at the American Farm Economic Association Meeting 1832
Report of the Employment Committee, AFEA 1833

Report of the Committee on Finance, AFEA, 1955-56 1833
Report of 1956 Membership Committee, AFEA 1835
Report of the Auditing Committee, AFEA 1836
Report of the Election Tellers, AFEA 1836
Minutes of the meeting of the Executive Committee and committee personnel of the American Farm Economic Association, Saratoga, California, August 26, 1956 1837
Minutes of the meeting of the Executive Committee, AFEA, Asilomar, California, August 27, 1956 1838
Minutes of the Annual Business Meeting, AFEA, August 28, 1956 1839
Minutes of meeting of the Executive Committee, AFEA, Tuesday, August 28, 1956 1841
Minutes of meeting of the Executive Committee, AFEA, Cleveland, Ohio, December 27, 1956 1844
Index to Volume XXXVIII 1847

1847 1844 1841 1839 1838 1837 1836 1836 1835 1833



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American Farm Economics Association—Western Farm Economics Association, Asilomar, California, 1956

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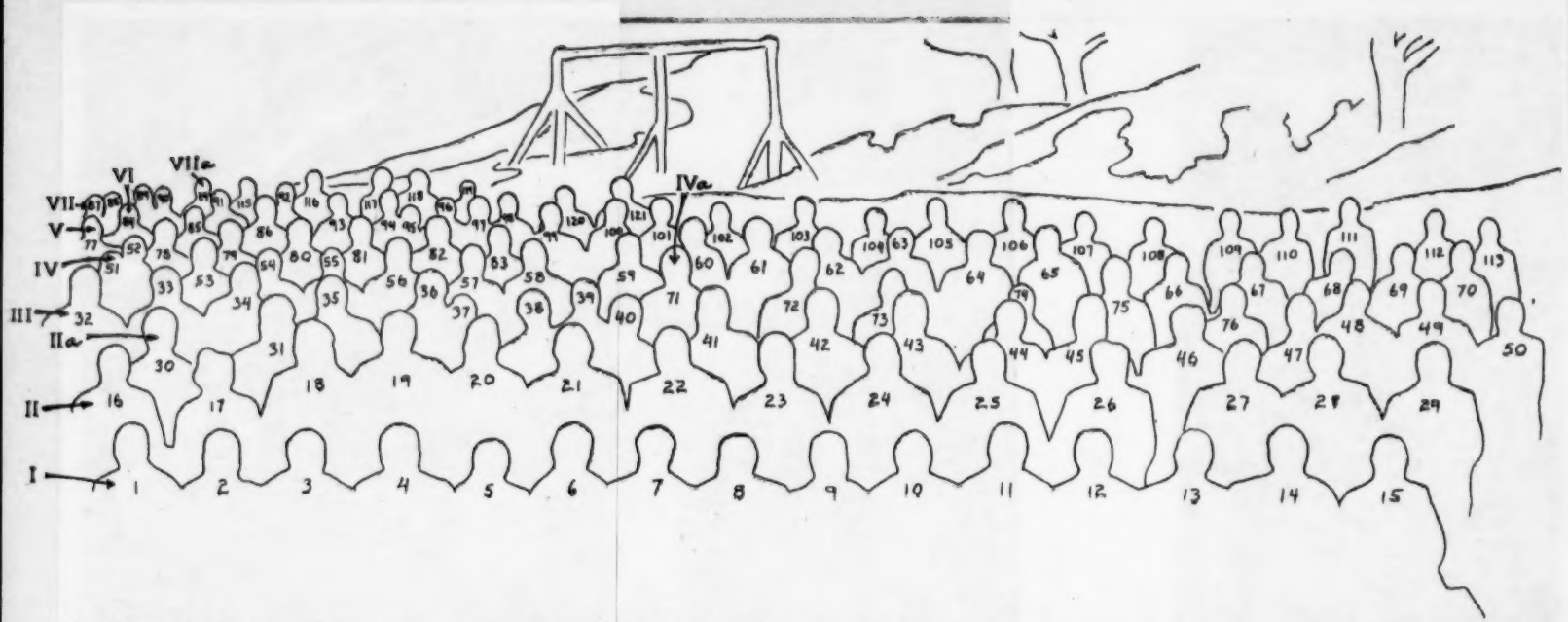

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AGRICULTURAL ECONOMICS IN THE YEARS AHEAD*

H. B. JAMES**
North Carolina State College

IT SEEMS appropriate for an agricultural economist to look backward before he attempts to look ahead. This I have done, but I do not plan to burden you with all that I saw in the rearview mirror. A few remarks about the past appear appropriate, however, since many of the problems we face tomorrow depend, in large measure, upon what happened yesterday and what is happening today.

In looking back through the literature, one concludes that during the period from 1910 to 1920 agricultural economists were concerned primarily with problems dealing with farm efficiency, farm ownership, credit, tenure, and, of course, the immediate problems brought on by World War I. During the 1920's farm economists were influenced by a depressed agriculture in a prosperous economy. This gave impetus to discussion of the terms of trade between the agricultural and the nonagricultural sectors of the economy, to marketing, to cooperatives, to exports and tariff policy, and to methods of adjusting agricultural production.

The decade of the 1930's was one of depressed agriculture in a depressed economy. Farm economists gave greater emphasis to finding ways and means of getting agriculture out of its depressed condition and of appraising public policies used for this purpose. Direct governmental interference with the workings of the market place became widely accepted as desirable and even as a prerequisite to a prosperous agriculture. We were heavily influenced in the 1940's by war, world reconstruction and accompanying prosperity. There were those who could visualize the trouble ahead for agriculture, but their forecasts had little effect upon public policies. This was the decade when marketing research received its great impetus by the passage of the Research and Marketing Act. The

* Address of the President-Elect delivered at the annual meeting of the American Farm Economic Association, August 28, 1956, Asilomar, California.

** I am indebted to my colleague, J. C. Williamson, Jr., for his criticism and assistance.

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decade of the 1950's finds agriculture again depressed relative to the rest of the economy. As would be expected, questions of policy, the relative position of farm people as compared with nonfarm, and the marketing of farm products are receiving considerable attention.

During the last four and one-half decades, agricultural economics has gained considerable recognition as a field of research and education. If our profession is to continue to grow, to develop, and to gain recognition, we must continue to prove to our fellow scientists and to the public that we can make a worthwhile contribution to society. To do this, we must insist on good training at the university level, on the selection of important problems in our work, and on the creation of an environment in our institutions that is conducive to superior research, teaching, and extension work.

In discussing agricultural economics in the years ahead, I shall point out and discuss briefly some of the problems that, in my opinion, merit additional attention. I shall comment briefly on the following: (1) marketing and price analysis, (2) production economics, (3) interregional competition, (4) farm-nonfarm resource adjustments, (5) public policies affecting agriculture, (6) theory and methodology, (7) education and, (8) opportunities for agricultural economists.

Marketing and Price Analysis

1. *Demand analysis.* Demand analysis is one of the oldest and best-developed areas of empirical research in economics. Yet there is a surprising lack of information with which to attack specific agricultural problems. We need to be able to predict with reasonable accuracy the quantities of products that will be demanded by the public under specified conditions if we are to improve upon our long-range work in resource allocation. In order to do this, we must know more about price elasticities of demand so that we may deal more accurately with specific proposals that affect price. We must know more about income elasticity of demand so as to make better long-run forecasts of shifts in the demand for products. We also need to know more about other characteristics of consumer demand such as regional differences in consumer taste and consumption patterns. This is important if we are to do an intelligent job in dealing with consumer education, promotional programs, problems of location of marketing facilities, and problems of adjustments in production.

2. *Supply and demand for marketing services.* In his theory of joint and derived demand, Alfred Marshall provided us with a potentially powerful tool in analyzing the demand for and supply of marketing services. Relatively little use has been made of this tool in isolating the market sector of our economy for analytical purposes. Yet there is no area in which there is greater need for a more analytical approach.

We need to know more about the nature of the demand for marketing services. We should take a new look at the supply of farm commodities and the demand for consumer products. These are the basic components of the demand for marketing services. We need to know more about the supply schedule of marketing services and the behavior of the marketing sector in response to changes in demand. In addition, we need to know more about the inter-relationship between the characteristics of demand for and supply of marketing services and the structure of the marketing sector. For example, does a highly variable local supply of livestock create instability in the demand for services of local slaughter plants? If so, what effect does this demand instability have upon location and scale of slaughter plants? More information along these lines would be extremely valuable to areas that are making adjustments in their agriculture calling for the location and development of additional marketing facilities.

3. *Market-firm analysis.* I suggest that additional attention be given to an economic appraisal of marketing technology and to a study of efficiency of operation of individual marketing firms. This area affords the researcher an opportunity to do something similar to what the farm management man does for the farmer. In contrast to aggregative analyses, it will point out ways and means of improving internal adjustment of the individual firm in a given environment.

4. *Factor markets.* Agriculture is fundamentally an industry that brings together a variety of productive factors to turn out farm products. The efficiency with which the agricultural sector performs this function depends to a considerable extent upon the characteristics of supply of factors. It appears to me that farm economists have either overlooked or underestimated the importance of this area of research. How efficient are firms that supply factors to the farmer? What is the structure of factor markets? Is there sufficient competition to protect the farmer against exploitation? What are the effects of legal and institutional restraints upon the operation of the factor market and do they promote efficiency?

5. *Market structure.* I believe we need to give additional attention to the way in which our markets are organized, to the size of firms, to the way in which these firms fit into an over-all pattern to provide the services demanded in an area. We should develop alternative marketing structures to show what the cost would be of transferring from one pattern to another. I do not mean cost merely from the dollar and cents viewpoint. In addition, I mean cost in terms of what would have to be given up in terms of freedom of the consumer and the producer in shifting from one pattern of market organization to another. It might also be well to point out some of the barriers to shifts in market structures.

6. *Location of marketing facilities.* More attention should be given to location of marketing facilities, particularly in the areas that are making

adjustments in production. This is a question of the application of location theory to marketing firms. We must be able to supply usable information to those involved in deciding where marketing firms will be located. Errors in location may cost the farmers precious markets as well as result in a loss to the firm involved.

Production Economics

1. *Supply response.* If it were not for speculation and informed guesses, the supply side of the demand and supply analysis in American agriculture would be an empty economic box. Perhaps the large amount of "accidental" variation in output arising from uncontrolled factors, such as weather and pests, and the discrete nature of technological change have made it difficult to isolate the response of supply to price and to nonprice incentives. Whatever the cause, however, a lack of information on supply response is a major source of weakness in the field of agricultural economics. For example, disagreement as to the response of agriculture to price incentives is *the* bone of contention in the flexible versus rigid price-support argument. This and similar demands for something meaningful in that empty economic box cannot be forever ignored by the farm economist.

2. *Structural changes in American agriculture.* We are all aware of the continuous change in economic structure of agriculture. Generally, we are most concerned with structural change that creates or threatens to create large social dislocation. One example of this is the long discussed upheaval some feared would result from the development of an efficient mechanical cotton picker. It seems to me, however, that the farm economist has missed his best opportunity to make a contribution if he restricts himself to consideration of such obvious problem areas. We should be most concerned with those structural changes of which the layman is least aware.

Several questions related to structural change appear to me to be of particular importance. Is technological advance creating economies of scale to the individual firm such that the family-type commercial farm cannot compete with larger firms? If so, is this a necessary characteristic of technological advance? Or have research activities, financed largely through public funds, unintentionally promoted this type of technological advance? What part does imperfection in the credit market play in current changes in firm and industry structure? Is vertical integration in the broiler industry, in which the feed dealer-processor provides essentially all the management functions, other than day-to-day supervision, a by-product of imperfections in the credit market? Or is it a more efficient means of bearing risks? These and similar questions need careful study both from the point of view of their implications for economic efficiency

in the short and long run, and from the point of view of the value patterns of the American people.

Inter-Regional Competition

Additional attention needs to be given to questions of inter-regional competition and adjustments in agricultural production. What are the factors involved in inter-regional competition, and what are the factors that are bringing about shifts in production between areas? If we are to do an intelligent job in developing farm programs in our states, we must be able to answer these questions.

Studies in inter-regional competition call for data at the farm level, data on the economics of transportation and processing, and data on regional levels of consumption and demand. We need to develop our programs of research so that all aspects of these broad problems can be studied. We do not have to work on all fronts at the same time, but we should organize our research so that we can tackle one segment at a time and yet fit all of these segments together to give us an understanding of the broader issues. For example, does a region's advantage in the production of a particular commodity lie on its farms, in its factor markets, in its product markets, in transportation, or in processing? These things can be studied individually, but the entire program of research on this group of problems should be developed first so that the relationship of each individual study to the over-all program of research is known in advance. Hence, one accumulates information needed to handle the larger problems as one finishes the smaller individual studies.

Farm-Nonfarm Resource Adjustments

The fact that we are meeting here this week as a group of economists primarily interested in the problems of agriculture may be interpreted in two ways. This specialization may be interpreted as reflecting a belief on the part of farm economists that the problems of agriculture are unique and that farm problems may be attacked in isolation from the rest of the economy. Or it may be interpreted as reflecting a belief that farm problems merit special attention although they must be properly related to the general economy. Over the years farm economists have shifted from the former toward the latter belief. The change has resulted primarily from an improved economic literacy on the part of farm economists, and I do not believe the change has yet run its course. I also believe that the change has been good for the profession, for out of it has come a more realistic view of the farm-nonfarm resource adjustment problem.

It is evident that the low-income problem in agriculture is not capable of solution within agriculture alone. Resources, particularly human resources, must transfer from the farm into the nonfarm sector. But this is

the statement of a problem and not its solution. Large farm-nonfarm income differences have existed for many years, and the farm economist was many years late in popularizing the fact. Almost every Southern farm boy in the past two generations has received the fatherly advice to do something other than farm to earn a living.

The question still remains as to why such large income differences have persisted. I am convinced that the answer to this question cannot be obtained by looking at agriculture alone or through a superficial look at the nonfarm sector and the barriers to movement. The farm economist must cross the border and take a comprehensive look into the nonfarm sector to find these answers. What accounts for the high wage rate and apparent job rationing in industries located in a rural setting? What are the true income prospects for persons moving from the farm into nonfarm employment? What is the poverty problem in the nonfarm sector and how, if at all, does it differ from the poverty problem in agriculture? Is it possible that a general attack on poverty might be more effective than our present farm programs in solving the farm-nonfarm resource transfer problem?

Public Policies Affecting Agriculture

Most agricultural economists like to talk about farm policy. I am no exception, but rather than discuss farm policy, I promise to stick to my knitting and suggest areas that I feel should receive additional emphasis.

1. *Conflicting objectives.* I think we need to study the objectives of public policy and to analyze carefully the conflicts arising in public policy and in the various public programs. For example, should we spend public funds on land reclamation and land rental at the same time? We need to analyze our programs carefully and bring questions of this kind clearly and objectively into focus.

2. *Effects of public policy.* We need to analyze our public programs carefully to determine their effects. In the price policy field, we need to study the effects in terms of income distribution within agriculture and between agriculture and the nonfarm economy. We need to determine their effect on resource adjustments within agriculture and between agriculture and the nonfarm economy.

The public cannot be in a very good position to appraise a program unless it has some idea as to the effects of this program. In my opinion, the public would like to have more research resources devoted to an appraisal of the effects of public policies and programs. Our experience in North Carolina indicates that the public really wants to know what the effects of specific courses of action are likely to be. On the other hand, I think they guard with a great deal of care their right to decide whether they like or dislike the effects. I believe we have an obligation to provide the public with information on the effects of specific policy alternatives.

3. *Alternative public policies.* In this country public policies are established through the political process. Policies that emerge reflect compromises among political factions and interest groups, and are usually something less than the economist would like. In this environment many competent economists become "purists." They attempt to escape from political reality by dealing with policy problems only on an abstract, theoretical level. In doing so, they fail to recognize the complexity of policy problems and deny the general public and the Congress the benefit of their insights.

There is a real need for new approaches in the farm policy field. I believe that agricultural economists are well qualified to suggest alternatives. In order to make their ideas effective in the political arena, however, they must make them meaningful to the public and to the politician. This can be done only if economists present their ideas in the form of specific policy proposals, including considerable detail upon the mechanics of the proposed program. Farm economists, particularly those in the land-grant institutions, should devote more resources to this work.

Theory and Methodology

In recent years, a sizable share of program time at the annual meeting of this association and at other professional meetings has been devoted to a discussion of economic theory and research methodology. A number of competent persons have set forth their ideas concerning the most urgently needed developments in these fields. This seems appropriate to me, but what is needed in addition is a more widespread appreciation of the importance of theory and methodology and a more dispersed effort to make advances along these lines.

I realize that the United States Department of Agriculture and the land-grant colleges were developed to solve problems, but if they are to do an excellent job of service research, their staffs must have a set of good tools with which to work. I do not mean that the land-grant colleges and the United States Department of Agriculture should reduce their efforts and expenditures in the areas to which they now devote the major share of their effort. However, I do feel that an opportunity should be made available to competent people in these organizations to devote time to research designed to improve theory and methodology. This opportunity now exists in a good many places, but is definitely not adequate in others. If we are to be successful in the long run, provision must be made for the development of new and better research tools.

Education

The economist, along with other social scientists, is in a peculiar position. He deals with phenomena that are quite commonplace. In many cases, laymen are more familiar with the mechanics of the economy and

with the technological aspects of the market than are most economists. This tends to create a false sense of simplicity of problems and produces an environment in which the "garden variety" theorists flourish. Unlike his colleagues in the physical sciences, the economist cannot expect an unquestioning acceptance of his findings. Many untrained people feel that they are qualified to have opinions too. Under these conditions, education of the general public in matters of economics becomes a more important, though more difficult task.

In my opinion, there are three areas in which educational programs in economics need strengthening. These three areas are relevant whether dealing with resident instruction in the colleges and universities or with extension and other adult education programs:

The first of these areas to which I refer is theoretical training in economics. We should not be hesitant in teaching people at all levels the basic theory that underlies economic analysis. It is no affront to the profession to say that this theory is simple and can be understood by the average person. It is the formal tools of analyses in empirical investigation that are difficult to master. Consequently, it is difficult for me to justify college programs and adult education programs that refuse to deal with theory.

The second area is economic communication. In many cases, economists have become over enthusiastic about terminology and more complicated ways of saying simple things. But somewhere in the profession there must be a place for getting out economic information in an understandable form if it is to have value to the decision-making units in our economy. At least once each year every professional economist should try explaining briefly and concisely some economic problem, or the results of economic research, in such a way that it can be understood by an average layman.

The third area is the limitation on economics. In our efforts to convince people of the importance of economics, we have often failed to acquaint them with the assumptions underlying and essential to economic analysis and the limitations that these assumptions place upon economic analysis in attacking social problems. Part of this is due to our failure to specify when we stop speaking as economists and when we begin speaking as average citizens. After all, once the economic implications are spelled out, there is no reason why the economist should be better equipped than the noneconomist to choose between two alternatives affecting the social welfare. Failure to acquaint the public with the limitation on the decision-making powers of tools of economic analyses can discredit the profession.

Opportunities for Agricultural Economists

I suppose you wonder why I chose to deal with what I felt would be important problems for the years ahead. I did this because I feel that it

is extremely important that we work on problems that are important, and that we anticipate important problems and have our informtion ready by the time the public needs the answers. It is not enough to discover that a problem did exist and that a satisfactory answer was found. We need to continually look ahead and to ferret out the important problems so that we may have our analysis ready for use when the proper time comes. Incidentally, this can do a lot to strengthen our public relations program.

Agricultural economics offers a promising career to the qualified young man. Opportunities for achievement, personal satisfaction, and a chance to make a contribution to the general welfare are good indeed. What is more, the demand for well-trained agricultural economists is excellent and shows no signs of declining. Industry has learned that agricultural economists are well trained, that they know how to do things, and that their performance is excellent in industry as well as in government. The future of our profession is bright. In the final analysis, it depends on how well we perform.

THE AGRICULTURAL PROBLEM

JESSE W. TAPP*
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ABOUT thirty years ago, William Allen White stated that three men are to be distrusted who discuss the farm problem. First, the man is to be distrusted who says that there is no farm problem because farmers are faced with difficult problems of adjustment to changing domestic and foreign markets. Second, the man is to be distrusted who states that he has some simple over-all formula for the solution of the farm problem since the problems of agriculture can not be resolved by some general formula approach. And finally, the man is to be distrusted who says "let the farm problem ride." The adjustment problems of agriculture are too important to all segments of the national economy to be allowed to "ride." Most students of agriculture will concur with these statements of Mr. White although some are still searching for a magic over-all formula for the solution of agriculture's problems.

The proposed solutions of the farm problem about which we know the most are those that have been tried in the past and found unsatisfactory. Some we have tried more than once with the same, but usually more expensive, experience. Others are in process of being tried a second time with new names and new slogans. It is not uncommon for agricultural economists to be chided because they know too much about proposed solutions that won't work, and too little about the merits of the latest proposed cure-all.

Underlying Factors Responsible for Adjustment Problems in Farming

In order to focus attention upon the fact that there is no single, all-purpose, easy solution to the complex of adjustment problems faced by farmers it may be well to review in brief some of the underlying factors responsible for these problems. This review is not intended to be all inclusive.

1. The farming business has by nature certain inherent characteristics of instability and change. So have most other businesses in our fast-changing economy.

Farmers must contend with variations in climatic conditions that affect yields per acre and production and often cause wide year-to-year changes in income for large numbers of farmers.

For generations our livestock industries have been characterized by cycles of expansion and contraction. This is in considerable measure due to the biological nature of these industries. These cyclical fluctuations can

* Chairman, Board of Directors, Bank of America, National Trust and Savings Association. Luncheon address delivered at the annual meeting of the American Farm Economic Association, August 29, 1956.

no doubt be moderated, but aside from an intolerable scheme of production quotas they can not be eliminated.

Long-term shifts in the demand for individual farm products are characteristic of our farm markets. The shift in demand from apples and dried fruits to citrus and other fruits has been in progress for many years. Even since 1940 the growth in demand for frozen concentrates in the citrus field has greatly changed the complexion of our fruit-growing, processing and distributing industries, and the end of such changes is not in sight. In the other direction we have witnessed for years a long-term downtrend in the per capita demand for potatoes and wheat products while the per capita consumption of meats has increased.

These illustrations are merely to point out that the farming business is a part of our ever-changing dynamic economy. Nonfarming businesses have similar problems.

2. The mechanization and modernization of commercial agriculture has made revolutionary progress in the past forty years and especially since 1940. This is reflected in higher production per acre and per man hour as well as the higher aggregate production. In many segments of agriculture the growth of production has exceeded the growth in demand.

3. There are large numbers of farmers in the United States, who for one reason or another, have not or can not meet the pace set in agriculture by modern technology. In a sense these farmers have been left stranded as a result of the revolutionary progress in agriculture as a whole. In important areas of the country, farming by the methods of a few decades ago is no longer economic, and, because of reasons of topography, soil, technical know-how, etc., the possibilities of mechanizations and modernization are limited. These factors give rise to some of our most urgent regional problems of agricultural adjustment.

4. Important adjustment problems are a legacy of wartime and postwar developments in the demand for farm products.

Wartime and postwar relief demands provided a great stimulus to farm production in order to meet temporary needs. This is particularly true of wheat and rice. In some respects our wheat and rice industries are comparable to our shipbuilding industries in so far as the demand for products is concerned. Twice in this century we have seen an enormous expansion in the production of wheat, rice and ships for wartime and related demands. It is much easier to meet the adjustments in the shipbuilding industry after the demand subsides than it is in the case of wheat and rice.

Technological progress in agriculture is also encouraged in wartime due in part to the urgency of the needs and in part to farm labor shortages and higher inducements in the farm prices.

Another legacy of war that vastly complicates the adjustment problems of farmers is the inflation in farm production and distributions costs. Al-

though this effect is not limited to agriculture, its impact is much more severe in the farming business because of the nature of the demand for farm products in a nonwar economy. Furthermore, it tends to encourage the belief that the farmers' problem is primarily a price problem which can be met by price manipulation when as a matter of fact the adjustment problems are much more difficult than that.

5. Governmental policies have contributed to the adjustment problems of farmers and in some cases have made the needed adjustments more difficult of attainment. This is particularly true of the price-fixing actions from 1930 to date which have been carried out under the seductive names of "price stabilization" and "price support." These operations have contributed to the loss of both domestic and foreign markets.

Our experiments in price fixing have added some stimulus to the substitution of synthetic fibers for natural fibers. They have encouraged the shift from butter to vegetable oil product substitutes—a shift that appears largely irreversible.

Our price-fixing and government storage policies have tended to place the United States farmers in the position of residual suppliers of products for foreign markets. Products once accumulated in the hands of the government outside of normal trade channels are difficult to sell in foreign markets except in times of war or great relief demand. Their sale becomes a matter of high State policy and the difficulties of sale are enormously increased by the fact that international trade policy between friendly nations is involved.

Our price-fixing policy has also tended to stimulate foreign production. This is especially true of cotton and to a lesser extent of tobacco and wheat. Here again it appears likely that the inevitable reversal of these policies will damage to some extent our normal commercial trade relations with some of the countries that have been induced to expand because of our price umbrella activities.

The use of acreage controls in an effort to control production and maintain fixed prices for cotton and wheat has added stimulus to the expansion of the livestock industries by shifting acreage to the production of feed grains and pasture. The acreage allotment programs have not been very effective in controlling production, but they have tended to prevent desirable adjustments in some areas and to encourage uneconomic adjustments in other areas.

Finally the governmental policies of the postwar years have led to the accumulation of such large inventories of products in the hands of the government that this problem of the government it now regarded by many as the most serious aspect of our "farm problem." It has been pointed out that the mistakes that the government makes on behalf of the farmer tend to fall back on the farmer in the end. Certainly the disposition

of the government's inventories of cotton, wheat and other products from prior years' production is not likely to be accomplished without serious impact at some point upon the current income of farmers.

The government's farm product inventory problem tends to encourage all types of panicky proposals for disposing of the accumulated surpluses. There is real danger that the methods adopted may lead to further restrictions on our exports to friendly nations and hence to more serious production adjustment problems. Two-price systems, export subsidies, etc., may help to move existing surpluses temporarily, but they could easily lead to further steps toward world wide restrictionism to trade in farm products that could further hamper our ability to market such products as corn, wheat, cotton, tobacco, and rice in foreign markets. Such a result would be most detrimental to farmers. Hence the liquidation of present inventories must be approached with patience as well as determination.

Where Do We Go From Here?

The facts outlined above are designed to indicate the complexity and diversity of adjustment problems faced by our agricultural industries. They point up the fact that no simple over-all solution is indicated.

One need of the moment is to discourage excessive promises of some quick, easy answer by the legislative route. No one is promising to governmentalize farming. Nevertheless, many of the proposals that have substantial support would, if carried out, take the farming business further down the road of governmental control.

Another need is to get rid of some well-established illusions about the effectiveness of price supports, acreage controls, the soil bank, and other appealing devices, as a means of maintaining farm income. These may be necessary tools as a part of a program to deal with some of our present adjustment problems, but they must not be the primary goals or objectives or means of attaining an effective farm adjustment program.

The attention of farmers, farm leaders, and the related industries needs to be focused upon the job of building real markets—domestic and foreign—instead of upon price fixing and production control. There is still much room for expanding the consumption of farm products by proper emphasis upon the upgrading of diets with particular attention to meats, dairy products, and fruits and vegetables. The efforts being made by the National Cotton Council both at home and abroad are illustrative of the needs of the situation and of the possibilities.

There is a great need to speed up the agricultural adjustments called for in the disadvantaged areas in agriculture. Full employment in the nonfarm economy and further progress in the decentralization of nonfarm employment will be most helpful in this process. Some redirection of

educational and job information programs is also called for in these areas. A combined regional and community approach to some of these problems is required and the opportunities for cooperation between business and agriculture are very great indeed.

The United States is fortunate in having the most productive, the most efficient, the best equipped, and the most dynamic agriculture in the world. Our primary objective must be to preserve these dynamic qualities. If we are to do this, we must eventually terminate a quarter century of futile and damaging price fixing for major farm products. We must reverse the current trend toward the external and internal dumping of farm products. Dependable markets for farm products can not be built on the basis of open or concealed export subsidies or multiple price systems. Destruction of potential markets is a more likely eventual result of such programs.

The price-fixing, production-quota road in agriculture, including the soil bank, leads progressively toward the governmentalization of agriculture in our most productive farming areas, and to the rationing of poverty in the disadvantaged farming areas. This is probably what the editor of the *New York Times* had in mind when commenting recently upon the farm problem as follows:

> "The farm problem is a great leveler and unifier. Let the staunchest free marketer and rugged invidualist tackle it in public office, and he will end up on nearly common ground with the veriest New Dealer—Controls and Subsidies."

But "controls and subsidies" are not consistent with a dynamic, productive, and efficient farming business. Farmers will not be content with controls and subsidies as a continuing answer to the adjustment problems of their important segment of the American economy.

CALIFORNIA AGRICULTURE—ITS UNIQUE FEATURES AND PROBLEMS

J. Earl Coke*
Bank of America

IN THE interests of time it is fortunate that my remarks are limited to the *unique* features and problems of California agriculture. Even that is a large order. If given free rein to talk about California agriculture . . . in toto . . . I am positive I could put any Texan to shame.

In fact, some of you might then compare me to the politician who, emotionally and at length, declared he was "addressing his remarks to posterity." A weary listener reminded him he didn't need to keep talking until his audience showed up.

If we speak of the unique features of California agriculture and use Webster's definition of *"being without a like"* we have little to talk about. California agriculture has a likeness to almost every kind of farming endeavor in the United States. Being Californians, we of course use the word "unique."

With the exception of a few crops such as tobacco, sugar cane and maple sugar, we produce commercially all the crops grown in the United States and a few not grown elsewhere. Our agricultural uniqueness lies in our variety. We list some 269 commercial agricultural crops, and when the livestock products are added agriculture can point to at least 275 commodities produced for the market.

The list of crops in which California is in first place among states in their total value is long. To mention only a few, they are grapes, lettuce, barley, tomatoes, sugar beets, peaches, lemons, dried beans, strawberries, walnuts, cantaloupes, apricots, olives, figs, dates and many vegetable crops. One-third of the commercial fruits . . . both fresh and processed . . . are produced in this state; one-fourth of the vegetables; and two-thirds of the tree nuts. Of the United States production of dried fruits California accounts for 95%; and for ⅓ of the world production. Cotton . . . a very minor crop in this state until the 30's . . . now produces nearly 10% of the state's cash receipts and an equal percentage of the nation's total farm income from cotton.

This variety of our agricultural production is made possible by our climate. Certainly no one will object when we say that the word "unique" DOES apply to California's climate. (And I am sure our friends from Florida will pardon me.) The state, almost a thousand miles in length and 200 miles wide, is characterized by its rainless summers and mild

* Vice President, Bank of America, National Trust and Savings Association. Luncheon address delivered at the annual meeting of the American Farm Economic Association, August 27, 1956.

winters. Of course there are exceptions to this characterization . . . but when it occurs we Californians call the weather "unusual."

From the Imperial Valley on the southern border, where farming is conducted at an elevation of more than 200 feet below sea level, the winters are summers and the summers are . . . to the uninitiated. . . . Inferno itself, to the agriculture in the mountain valleys at 5000 feet elevation where frosts may occur any month of the year; from the coast areas cooled by the ameliorating effect of the Pacific Ocean to the interior valleys where high temperatures prevail in summer, the variety truly is unique.

In the main agricultural areas the rain falls principally from December to March in quantities from scanty to moderate, and a long frost-free growing season prevails . . . that is, unless the weather is unusual. Were it not for the high mountains on our eastern and northern borders on which the winter snows are stored and the run-off in increasing amounts held behind large dams, the uniqueness of California agriculture would be far different. To a large extent we would be producing as we did soon after gold was discovered . . . dry land crops, cattle and sheep.

Not only do we have variety in climate and crops, but we have variety in soils. More than five hundred soil series are classified for California and the types within these series number thousands. This is a unique feature in California farm land when compared with other states. Some soils are very good, but many are very poor . . . that is they were until our farmers got hold of them.

This state's agriculture, with its 11½ million acres of arable land of which 7 million acres are irrigated, is unique not alone because of its climate and soil but because of the action of men. Our agriculture grew up in isolation. California truly is "an island in the land." It is surrounded by high mountains or desert on the north, east and south. To the west lies the Pacific Ocean. In the days before railroads, California's access to China and Australia was far easier than it was to the centers of population on our east coast.

California's isolated geographical position had a far-reaching and beneficial effect. It brought to the state the true adventurer. The early California farmer had banded together in a tight though sometimes cosmopolitan circle with his fellows to fight off marauding Indians as his wagon train crawled across the plains. The effort and struggle to get to California in the mid-1800's perhaps taught the pioneers the benefits and strength that are gained through unity. At least "building together" has been dominant in California's agriculture.

The resourcefulness, imagination, daring and ingenuity of our grandfathers is still being felt today throughout the length and breadth of California's acres. An example of this is seen in the manner in which the

water problem was tackled. Lack of water during the long, dry, rainless summers would have kept California in its initial role of producer of cattle and sheep and dry-land grains. To the pioneer farmer this was a challenge. He joined together with his neighbors and began the development of irrigation. He had not as yet learned to sit back and let Washington do it for him.

Most of the 7 million acres now irrigated have been the result of private enterprise . . . of individuals sinking wells or groups working together to bring this water to the farms. Incidentally, about ⅛ of the acres irrigated in the United States are in this state.

Early-day isolation of the California farm from the nation's markets was the basis of another unique feature of the state's agricultural effort. Strong, energetic commercial and cooperative organizations market most of our produce. 461 cooperative associations of California farmers do a business of over 800 million dollars annually. In the early days they had to join together to get their produce to market in an economical manner. This pioneer "know-how" is effective still today.

Sixty years of experience has demonstrated that the large commercial and cooperative organizations that have developed in this state are necessary to distribute our fruits, vegetables, cotton and other commodities to their distant and widely scattered markets. California's success in competing for national and world markets is a credit to skillful handling, level of quality maintained, and the advertising and promotional activities of these various agricultural groups.

California agriculture is characterized by M. K. Bennett* as "specialized, commercialized and mechanized." "The farmers," he writes, "tend to specialize on one or two marketable products or groups of allied products. Most citrus growers produce nothing but citrus, most prune growers nothing but prunes and apricots, a great many barley farmers nothing but barley and wheat and so on. . . . The so-called 'general farm' so common in many states is not a type of farming . . . found in California." He continues in part, saying that the agriculture of California is commercialized in two senses: individual farmers here produce for open market sale as opposed to household consumption; and second, the state as a whole ships much of its farm output to other states and foreign countries. Actually, the subsistence type of farming in California is so rare that it is not even listed.

Mechanization is highly developed. Tractors, trucks, combines and hay balers provide a total horsepower of 8,370,000. The annual use of electricity per farm is 47,000 kilowatt hours as compared with the United States average of 5700. 62% of our state's cotton is harvested mechanically

* M. K. Bennett, "Climate and Agriculture in California" *Economic Geography*, April, 1939.

as compared with 22% for the rest of the nation. Almost 100% of our sugar beets are harvested mechanically, all the rice is planted by airplane and our 370 pilots licensed to apply pesticides on agricultural crops treated nearly 5 million acres last year. Lemons are sorted for color in packing houses through the use of electronics; hydraulic towers are used in the picking of fruit and pruning trees. Yes, California agriculture is highly mechanized—perhaps uniquely so.

Unique also are the average yields of many of our crops. Our high agricultural labor rates, land values, taxes and cost of transporting so much of our production to distant markets have put the pressure on our farmers to produce more efficiently. Higher yields is one method of attaining lower cost per unit of production. Between 1930 and 1950 the over-all yield of our fruit crops per bearing acre increased 65%. Incidentally, the average yield of these fruit crops is also 65% greater than that for the rest of the nation. California tomato yields are three times, and cotton more than twice that of the rest of the country.

Let's pause a moment and appraise the dollars and cents effect of the California farmer's adaptation to prevailing climatic and soil conditions. California's agricultural production leads the nation in the total value of the products which it sells. In 1955 this value was $2.6 billion, or 8½ per cent of the total gross returned received by all farmers in the United States. This figure was attained by California farmers who represent 3% of the nation's farmers.

Obviously, increasing levels of income will be reflected in high land values and capital requirements for farming operations. The average California farm in 1954 had a value in land and buildings of nearly $60,000 compared to a United States average of $25,000, and the realized farm gross income in that year was $19,986 compared with a United States average of $6,666.

I suppose I would be derelict if I did not also say that California's agriculture is unique in the size of its individual farming operations. The state has been charged with an agricultural system of "factories in the field." Although it is true that we have some very large farming operations, the majority by far is the so-called family farm. By that definition we mean that the family is the nucleus of the operation of that farm. With modern machinery and production methods at the level they are, the size of the family farm in increasing simply because a family can, and usually must, farm a greater number of acres if they are to stay in business.

Without question the ready availablity of capital funds has played a unique and important part in the progress of California agriculture. Again, here in the Golden West, we have a system of banking tailored specifically

for the California farmer's financial needs. I do not believe I am prejudiced when I say that branch banking has offered the very type of credit assistance particularly required by the California farmer. The amount of money that can be loaned by a branch bank in any one village or town is not limited nor related to the amount of funds on deposit in that branch. This is so because the branch bank may draw upon the entire system, of which it is a part, for loanable funds. Money deposited by industry and business in metropolitan areas is available for credit purposes to the farmer. Because each California farming community has not been restricted to its own resources for growth capital, the development of its agricultural activity has been at a faster rate than otherwise would have been possible. That Californians need, use and like branch banks is evident in the fact that since 1940 the number of branch banks in the state has nearly doubled.

We have looked at the attractive side of the picture, now let's consider some of the problems confronting California's agriculture. Of course, some of the problems have changed. They say that the hardships borne by the pioneer mother as she raised a family while plowing, milking and bringing in the harvest was as nothing compared to the modern mother's dilemma as she copes with her children when the television set is on the blink.

If one were to ask almost any Californian what was the major problem confronting the farmers of this state, the answer would almost universally be water. It has been since the early development of irrigation and will be until we more completely develop our water resources. About half the irrigated land in this state is supplied largely by run-off water from the mountains, stored in reservoirs and behind dams. It was to impound this water for future distribution that our many water districts were formed.

The remainder of the California farmer's water supply comes from ground-water deposits. In contrast to irrigation districts composed of many farmers, this water supply is tapped by each individual farmer as he drills a well on his own land. Some of these wells go down 2000 feet.

Unfortunately, the underground water supply in California is being depleted, or overdrawn, at the rate of approximately 5 million acre feet per year. It is estimated on the basis of our current growth and corresponding water needs, this overdraft will total 11 million acre feet per year by 1965 unless corrective measures are soon taken. I do not have to be a banker to emphasize the seriousness of an overdraft whether it occurs in an individual's checking account or in a state's water supply. A person cannot continue indefinitely to spend money in his checking account, no matter how worthy the purpose, without making a deposit. Neither can California's agricultural economy continue spending its water resources without finding methods of replenishment.

If we could utilize all of the water available in this state we would have little to worry about, but 70% of the stream flow in California is north of Sacramento while 77% of the present consumptive water requirement is south of Sacramento. Our problems therefore are the more efficient use of water and the transportation of water from the north to the south so that we may distribute it from where it is now flowing to the sea to the agricultural lands where its need is great.

Water shortage and its redistribution has a relationship to the problem of water excess. The Northern California floods in 1956 did an estimated 500 million dollars damage to crops and livestock. The state's water plan has for agriculture a dual purpose. On the one hand, it will provide for impounding and distributing water for irrigation and at the same time prevent the disastrous flooding. Unlike some of the West, California is not faced with an absolute shortage of water; the problem is one of storage and redistribution.

The second problem of importance to California is the pressure of increasing population on our farming operations. Perhaps her Chambers of Commerce have been too effective in their publicity; the net growth in California's population is at the staggering rate of 1,400 persons per day. Subdivisiions, industrial expansions, and highways are removing from production 100,000 acres per year and some of it our best agricultural lands. This naturally is raising the dollar value of remaining farm land.

In our state today approximately one-half of our arable lands are known to be affected with some form of salinity or alkali. To a varying degree, the production of crops has been decreased because of the presence of these salts. Much can be done to improve production upon these lands by removal of the salts. Associated with the problem of the salt content of our soils and with soil compactness is the difficulty of securing adequate water penetration on some of our irrigated lands. These, too, are real problems.

It is also estimated that some 10 million acres of land in the foothills of California are covered with brush which, if removed, would increase the carrying capacity of those lands for livestock. Through control burning and other means these lands now are being cleared and planted to grasses in large acreages. Experience indicates that the productivity of a great proportion of our vast range land acreage could be increased as much as 10 times by properly reseeding with selected grasses and legumes and with fertilization.

Of basic importance to California agriculture are its continuous efforts toward more efficient production, processing and marketing of its produce. A large percentage of the specialty crops raised here must find markets outside the state. They must be competitive with produce grown

more closely adjacent to the consuming centers. To meet this competition the quality must be continuously improved while reducing to an absolute minimum losses sustained through spoilage or deterioration.

With increased mechanization in agriculture today, with higher cost of land and labor and nonfarm products and material, today's farmer must be an accomplished business manager. Higher investment costs are a particular problem to the California farmer.

Management, Money and Marketing are the three big M's in California agriculture as it operates today. The 1954 census allocates to California 123,000 farms, but of these 73,000 produced 98.4% of the value of the products sold from farms.

With 6% of California's population living on farms as compared to 13% nationally, the problem in California of being certain that the nonfarm population understand these agricultural problems and are sufficiently sympathetic to them is of utmost importance.

There has and will be, no end of challenges facing the California farmer. Gaining a stronger position in the international markets certainly requires agricultural leadership in our state if we are to maintain or increase the production of many of our commodities.

In Southern California smog is adversely affecting agriculture. This is no joke, and smog elimination or the development of plants that will not be affected by the chemicals is of very real importance to the farmers in those areas.

But I have said that California agriculture is unique, and that most certainly applies in equal fashion to the farmer himself. That he has been able to succeed, with so many difficulties to overcome, is a real credit to his education, his ingenuity, his willingness to work together with others in finding the means by which his problems may be solved.

Then there is specialization itself. From a competitive market and farm management standpoint, specialization is an asset. Costs are better controlled, methods and techniques more rapidly applied and results more accurately measured.

There is, however, an opposite side to the picture. Once a tree or vineyard is planted; once specialized machinery is purchased; once irrigation patterns are established for a certain crop; then is that farmer bound to the agricultural product in which he has decided to specialize. If consumer tastes change, or markets contract, a specialized farmer can be in a dilemma. His capital investments, already made, restrict him from grasping the opportunities presented by the revised economic situation. Unless he can solve the dilemma he actually is deprived of the privilege of flexible choice offered by the state's diversified agricultural economy.

During 1955 Americans throughout the country spent an estimated $68

billion on food. This figure compared with $64.5 billion spent the year before. Early this year Paul S. Willis, president of the Grocery Manufacturers of America predicted that in 1965 the national food bill would be approximately $100 billion. We who participate in the California Agriculture effort are confident that this state will be able to contribute economically and effectively in that expanding market. California is a large state; its agriculture is dynamic; changes are continuous, in some instances radical and rapid. It is difficult to truly comprehend. It is more difficult to adequately explain. With you who know this state I gladly share the responsibility of giving to our visitors a clear and complete picture of California Agriculture—Its Unique Features and Problems.

A PREVUE OF CALIFORNIA AGRICULTURE

A. D. REED*
University of California

THE morning of August 24, 1956 was a clear, pleasant day in Berkeley, California, when some 65 people boarded bus and cars to take the Agricultural Tour preceding the AFEA-WFEA joint meeting at Asilomar. Many types of private and governmental organizations were represented by these people, who come from 18 states and 5 foreign countries. During the following three days the group visited seven of California's 123,000 farms and witnessed many of the interesting and unique features of California agriculture.

The purpose behind the tour was well expressed by Carroll Bottum at one of the luncheon meetings of the conference, when he said, "We found out on this tour that when Californians come back East and tell us about California agriculture, they are just trying to tell the truth." Some members of the group were disappointed in not seeing more fruit, since, in their minds, this was what constituted California's agriculture. They found it hard to believe that tree crops occupy less than 4 per cent of the land in farms, although fruit produces nearly 20 per cent of the state's agricultural income. The dependence of California agriculture on irrigation was also noticed. Although in general this is true, only about 7 per cent of the state and less than 20 per cent of the land in farms is actually irrigated.

The tour proceeded from Berkeley east across the Coastal Range into the "Delta"—an area at the confluence of the Sacramento and San Joaquin rivers with approximately one-quarter million acres of peat or highly organic soils. This area, reclaimed from tule swamp, is now highly productive of vegetable and field crops. Here farms are large because of the high reclamation costs to get the land into production and the extensive network of levees and large drainage pumps required to keep it in production. Most of this land is 12 to 14 feet below sea level and subsidence, caused primarily by oxidation but also by wind, is still going on at a rate of 3 to 4 inches per year.

The Atkins, Kroll and Co. ranch, which the group visited in this area, illustrates three phases of California agriculture:

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It is representative of the delta region.

It has absentee ownership with hired management.

And it is a producer-processor set-up with its own marketing outlets for at least part of the production.

Atkins, Kroll and Co. is an import-export outfit which bought this ranch after World War I as an investment. This is a large, diversified vegetable ranch typical of the "Delta" region. Following is a summary of its operations:

Crops Produced	Acres	Prices	Yield	Comments
Corn for husks	298			Husks used as wrappings for tomales. Processor harvests crop for the husks.
Corn for grain	55		3 ton	
Peas for canning	125	$66–90	2 ton	Trucked to cannery.
Spinach	271	$22.50	5 ton	
Barley	80		4,000 lb.	
Wheat	82		5,000 lb.	
Celery	264	$ 2.35	537–66 lb. crates	Packed and sold through wholesale outlets.
Celery seed bed	22			Produces seed from which transplants are grown.
Asparagus	526	$11.50 green $10.50 white	24 cwt.	Green sold through wholesale outlets. White trucked to cannery.
Leased asparagus	100			
Asparagus roots	51			
Potatoes	385		300 cwt.	Sold through wholesale outlets.
Seed potatoes	142		225 cwt.	Shipped to early potato area.
Total	2,260			

Labor Force

55 to 60 year around. 250 to 300 at peak during celery and potato harvest. Mexican Nationals and transients used. The ranch provides mess hall and bunkhouse facilities. Cost of $1.85 per day to feed.

Major Equipment	*Number*
Trucks	12
Cars	4
40 HP diesel track tractors	5
70 HP diesel track tractors	2
Small wheel tractors	8
Large wheel tractors	2

About $250,000 invested in equipment

Land in this area sells for around $300 per acre.

Since Delta land can be sold only in relatively large blocks, the price per acre is considerably less than is being received for land immediately outside the area, selling in small blocks. No definite rotation is followed, but current crop acreage is based on the past cropping system, plus the outlook for the various crops that can be produced.

On leaving the Delta region, the tour proceeded through the Lodi area

where more than 90 per cent of the state's 25,000 acres of Tokay grapes are produced and stopped at the Diamond Walnut Growers, Inc., plant at Stockton. Many marketing methods are used to get California's more than 200 commercial crops and 40 livestock products to the consumer. The Atkins, Kroll Co. sells some of its specialty crops direct to the cannery while other crops are processed, packaged, and sold through wholesale outlets under their brand name. The Walnut Growers' plant on the other hand, is one of the more than 400 cooperative marketing organizations in the state.

The Diamond Walnut Growers' plant receives, processes, and ships 100,000,000 pounds of walnuts a year—70 per cent of the entire national production. Their plant at Stockton is an outgrowth of the expanded capacity needed to process and market the California walnut crop as acreage has shifted from Southern to Northern California. The plant was dedicated the day before our visit and was not yet in operation except for some clean-up of the 1955 crop. The importance and complexity of cooperative marketing are illustrated by this plant, which has a floor area of 14 acres, has bulk-bin capacity for 4,500 tons of walnuts, can package 45 one-pound cellophane bags of nuts per minute, uses electric-eye machines to separate kernels according to color, and serves as many as 750 meals per day in the cafeteria.

California has been noted for its cattle-feeding operations with more than 500 commercial feed lots. The tour visited the Moffat feed lot at Manteca where some 40,000 head of beef animals have been fed in a year's time. Cattle of all sizes are fed at the same time in order to supply the diversified demand for beef. The ration fed is based largely on barley supplemented with alfalfa, sugar-beet pulp, rice bran, cotton-seed meal, and other feed as prices warrant. All the cattle in this feed lot are owned by the Moffat Company. No custom feeding is done as is the practice in many commercial lots.

A highlight of the trip was a visit to the U.S. Bureau of Reclamation, Tracy Pumping Plant. Water stored in the Shasta and Folsom reservoirs in the Sacramento Valley is released down the Sacramento River, then through the Delta Cross Channel to the pumping plant located about 45 miles east of San Francisco. Six pumps, each with 22,500 horsepower motors, lift the water about 200 feet and channel it into the Delta-Mendota Canal, which carries it a distance of 117 miles to the Mendota Pool west of Fresno. The water is distributed to farms along the Canal through 21 water districts. Power created at Shasta dam is used at the pumping plant to run the pumps, which can pump 2,000,000 gallons per minute.

The Agricultural Extension Service of the University of California is organized somewhat differently than many other state extension services. The professional personnel—Farm Advisors and Home Advisors—are employees of the University and are stationed in the counties through agreements with the County Boards of Supervisors. The counties furnish office space, stenographers, equipment, office supplies, transportation, and other necessary operating expenses. Although county extension service offices are often located in the courthouse or other public buildings, many counties are finding it desirable to provide special facilities for the extension service. Stanislaus County has just completed such a structure at Modesto, and with County Director of Extension, Albert G. Volz, as host, the group visited this set-up, consisting of the following:

Office—An $850,000 structure with 3 acres under roof housing the Agricultural Extension Service, Superintendent of Schools, Agricultural Commissioner, and the Road Department.

Extension Service Staff—11 Farm Advisors
3 Home Advisors
3 Assistants
6 Stenographers

County Budget—$50,000 a year to provide office space, stenographers, equipment, office supplies, transportation, and other necessary operating expenses.

Equipment—14 cars
2 pick-ups
1 jeep
2 150-gal. spray rigs
Fertilizer attachment
Garden tractor

Facilities—10 individual offices
4 double offices
secretarial office
store and mimeograph room
laboratory
cold room
demonstration kitchen
library
broadcasting room

Strawberry acreage in California has increased from about 5,000 acres prior to World War II to 19,000 acres in 1956. The group saw 10 acres of this increase at the Nob Ishida ranch at Ceres. Mr. Ishida has a total of 40 acres in strawberries scattered in several different fields. He also produces tomatoes and alfalfa. Many of the high-labor-requirement crops, such as strawberries and tomatoes, are grown by Japanese farmers such as Mr. Ishida.

Owing to the diversity of this operation, costs were not available on the planting of strawberries that was visited. However, the following costs are representative of the area:

COST PER ACRE TO ESTABLISH STAND

	Cost*		Cost
Disk, plow, harrow, etc.	$ 8.00	Cultivate	$ 12.50
Level and float	40.00	Hoe, weed, and transplant skips	100.00
Bed preparation	10.00		
Fumigation for nematodes	36.00		
Soil insect treatment	18.00	Pest control	10.00
		Miscellaneous	32.10
Total land preparation	112.00		
		County taxes	2.00
Planting	10.00	Repairs	3.00
Plants	135.00	Insurance	3.50
Irrigation labor	40.00	Land rent	80.00
Water	5.50	Depreciation on equip.	6.00
Fertilizer applied in water	6.50	Interest on equip.	1.90
		Cost per acre	$560.00

* Interest, depreciation, and repairs on tractor are included in these costs.

COST PER ACRE TO PRODUCE CROP

Yield			Cost
2nd year 12,000 lbs.		Pest control, 2 times	$ 10.00
3rd year 8,000 lbs.		Miscellaneous	64.55
Average/year 10,000 lbs.		Picking, 6¢ per lb.	600.00
		Hauling, $6 per ton	30.00
	Cost	Crates	24.00
Fertilize 4–6 times	$ 3.00		
Fertilizer	60.00	County taxes	2.00
		Repairs	3.00
Beat tops, ½ hour	1.25	Insurance	12.30
		Land rent	80.00
Irrigation			
30 times		Depreciation on equip.	6.00
40 man hours	40.00	Interest on equip.	1.90
		Depreciation on stand	280.00
Water	5.50	Interest on stand	14.00
Cultivate 1 time	2.50	Cost per acre	$1,400.00
Hoe and weed 4 times	160.00	Cost per lb.	.14

At the time of our visit to the ranch, growers were receiving about 12 cents per pound for their berries and the price got down to 10 cents at the end of the season.

Bush-berry acreage in Stanislaus County has increased from 295 acres in 1953 to 1,035 acres harvested in 1956. This increase is typified by the Joe Coelho ranch which was visited by the tour. Joe originally ran a small dairy ranch, but with boysenberries selling for 15¢ per pound in 1953, he decided there was an easier way to make a living than nursing a herd of cows. He dispersed his dairy herd and in January 1954 put his entire farm of 16 acres into berries. Today he has one of the best plantations in the central part of the state and is doing an excellent job, with

yields averaging 10 tons per acre. Details of the costs on this ranch were not available, but Mr. Coelho has approximately $250 per acre invested in trellis, vines, irrigation system, and equipment. His current costs of production are about 8 cents per pound. The price this past season will average about 11 cents per pound.

There was much speculation among the tour members as to the economic reasoning behind Mr. Coelho's change from dairy to berries and what change might be made should berries become unprofitable.

Egg production is a $150,000,000 industry in California. Production is scattered throughout the state but tends to be concentrated around the consumption centers of Los Angeles and San Francisco. There is considerable production throughout the San Joaquin Valley to supply both the local and other markets. The Rainbow Farms at Turlock is a new cage plant with a present capacity of 18,000 hens. This capacity is to be doubled within a year. Briefly, their operation is as follows:

RAINBOW FARMS, TURLOCK, CALIFORNIA

Resources
- Land—21 acres
- Cages—18,000 with sheds
- Brooders—6,000 capacity
- Growing space—6,000 capacity
- Feed storage— 5 ton chick ration
  10 ton grow ration
  10 ton lay or cage ration
- Refrigerated egg room
- Cleaner & grader—7 cases per hour capacity

Investment
- Approximately $100,800 or $5.55 per hen capacity

Practices
- Brood 6,000 every 8½ to 9 weeks—26 chicks per brooder, in brooders 6 to 7 weeks.
- Move to grow pens at 6 to 7 weeks—6 pullets to pen.
- Move to lay cages at 3 to 3½ months. One bird to a cage.
- Feed a complete mash ration custom mixed.
- Feed layers once per day—chicks 2 times.
- Gather eggs 2 or 3 times per day.
- Send eggs to market 3 or 4 times per week.
- Vaccinate:
  - Newcastle at 1 day-inter-ocular
  - Bronchitis at 14 days—spray
  - Pox & tracheitis at 8 to 10 weeks
  - Newcastle wing web at 12 to 14 weeks
  - Bronchitis when moved to lay house
- Same age birds kept together
- Cull once a week—egg production checked on questionable birds
- Feed delivery:
  - Cage— 6 ton every 5 or 6 days
  - Grow—6 ton every 10 days
  - Starter 2 ton twice for each brood.

Labor Force

Owners	3
Girls handling eggs	2 to 3
Laborers	2

Production
- Has been averaging between 73 and 74 per cent.

Since this ranch does not have any hens that have been in production for a year, the cost figures are not typical of the industry. The University of California Agricultural Extension Service does have management study records on 194 poultry ranches for 1955, however, and the results can be summarized as follows:

	State Average
Av. no. hens	3,165
Eggs per hen	229
% mortality	14
% culled	82
Cost mash	$4.00
Cost grain	$2.50
Average	$3.73
Lbs. feed per hen	129
Percent mash	78
Hours labor per hen	1.2
Average price eggs	42.6¢
Net cost per dozen	36.7¢
Management income per dozen	5.9¢
Income per hen	
Egg sales	$8.11
Poultry sales	.62
Miscellaneous	.05
Inventory charge	.31
Total	9.09
Cash & depreciation cost per hen	
Feed	4.96
Chicks	.54
Misc.	.50
Depreciation	.30
Hired labor	.28
Total	6.58
Farm income per hen	2.51
Family labor	1.02
Interest	.25
Management income per hen	1.24

The San Joaquin Valley area of California is one of the important milk-producing areas of the state, and the A. C. Pollard and Sons ranch at Turlock is a representative dairy operation. Here a father and two sons operate a market milk dairy, milking about 100 cows. The milk is transported by bulk truck to Oakland where it is processed for consumption as fluid milk. The ranch produces most of the roughage required but depends largely on purchased concentrate. The cows are fed chopped green feed rather than pastured. Very little hired labor is used. One son does the milking, another son handles the stock, and the father handles the field work. For operations requiring more than one person, they all work together.

DAIRY RANCH, TURLOCK, CALIFORNIA

Resources					
Land	Owned		73 acres @ 1000		$ 73,000
	Rented		86 acres		
Stock	Bulls	3	@700	$ 2,100	
	Cows	95	@300	28,500	
	Calves	36	@75	2,700	
	Heifers 1–2	13	@150	1,950	
	Heifers 2–3	15	@250	3,750	
					39,000
Buildings and Equip.	6 cow walk through milking barn			10,000	
	300 gal. bulk tank, refrigerator & cooler			2,300	
	Hay drier			300	
	Cement mangers			1,500	
	Calf shed			1,500	
	Bull pen			500	
	Trench silo			1,000	
	Green feed ramp & corral fences			1,000	
	Feed mill—2 ton per hour			1,700	
	Hand tools			500	
	Feed storage			500	
	Electric fence			200	
	2 tractors			4,400	
	Manure spreader			300	
	Pickup			1,800	
	Forage chopper			3,500	
	Rake			600	
	Tillage tools			1,400	
	Mower			425	
	Chopped feed wagon			1,000	
	Corn wagon			150	
	Corn pick			350	
	Total equipment				34,925
	Total investment				$146,925

Production Crops 1955	*Acres*		*Yield*	*Production*
Alfalfa	113	@	5.2 ton	585 ton
Pasture	13	@	4.6 aum	60 aum
Silage	23	@	14.8 ton	340 ton
Corn	11	@	4000 lbs	44,000 lbs
Barley	8	@	2000 lbs	16,000 lbs
Oats hay	15	@	1 ton	15 ton

183—34 acres double cropped

Dairy Av. B.F. production per cow—415 lbs.
Average test 3.6%

Income—1955 *69 cows*		
Milk sales 698.867# @ $4.01 cwt.	$28,124	
Value milk used on farm 30 cwt. @ $4.01	120	
Milk used by employees 45 cwt. @ $4.01	180	
Meat for family use	460	
Calf crop 68 @ $17.50	1,190	
Stock appreciation	5,670	
		$ 35,744

DAIRY RANCH, TURLOCK, CALIFORNIA (*Continued*)

Expenses			
	Hay 600½ ton @ $24	14,412	
	Pasture 61 aum @ $5	305	
	Silage 340 ton @ $7.50	2,550	
	Corn & barley 30 ton @ $45	1,350	
	Other concentrate 46 ton @ $70	3,220	
	Molasses 21 ton @ $26	543	
	Antibiotic 2 ton	120	
	Total feed		$ 22,500
	Labor—dairy only	3,935	
	Herd depreciation 69 hd. @ $23.75	1,639	
	Interest on dairy investment 49.760 @ 6%	2,986	
	Depreciation on dairy investment 23.060 for 10 years	2,306	
	Taxes dairy only	490	
	Artificial breeding & cow testing	525	
	Power, supplies, vet, repairs, etc.	1,518	
	Total dairy expense		$ 35,899
	Balance for owners labor & management		—$ 155

Calendar

There is considerable overlap on the feeding program but essentially it is as follows:
Feb–Oct—green chop
Nov–Jan—silage, hay, winter pasture
Heifers bred to freshen in fall and then approximately every 12 months thereafter. However, cows are freshening the year around.

The tour did not get far enough south to reach the cotton-producing area of California. The Fawcett and Son ranch at Los Banos does grow some cotton, however, and is fairly typical of the diversified agriculture on the west side of the San Joaquin Valley. This ranch was originally developed from virgin territory by Mr. Fawcett, in an area of hot dry summers, high winds, uncertain water supplies, and alkali. The original character of this county was such that only a determined person would stay with it and make a success of farming. Today, this is a highly productive farm, as the yields below will illustrate, and it is valuable for farming purposes.

COTTON FARM, LOS BANOS, CALIFORNIA

The farm is an example of a relatively large diversified operation with a variety of enterprises and a high degree of flexibility insofar as shifts in production are concerned. All the land is owned.

1956 Production	Acres	*Av. Yield 1955*
Alfalfa—keep 4–5 years	500	9 ton
Corn—has replaced milo	220	31 ton silage 8,000 lbs. grain
Tomatoes—has replaced melons	60	30 ton estimate for 1956
Cotton	170	1,000 lbs. (shooting for a 3 bale yield)
Barley	80	5,100 lbs.
Walnuts—8 years old	50	600 lbs.
Pasture	80	
Farmstead, roads, etc.	40	
Total land	1,200	

COTTON FARM, LOS BANOS, CALIFORNIA (*Continued*)

Dairy cows, 550 head total. Milk shipped to Los Angeles.

Major Equipment

2	65 HP track tractors	3	Pickups
2	40 HP wheel tractors	1	Truck
2	30 HP wheel tractors		Barley roller
3	20 HP wheel tractors		Seed cleaner
2	Feed wagons		Feed mixer
2	Field choppers		800 ton grain storage
10	Cotton wagons		1400 ton hay storage
	Combine		3000 ton silage storage
	Mower	14	Hired help houses
2	Rakes	1	200′ well—80′ lift
2	Balers		60 HP pump—1400 gallons per minute
	Road grader	7	Low lift pumps 20–50 HP
	Cotton picker		

Labor

3	Milkers	1	Dairy foreman
1	Relief milker	1	Farm foreman
1	Feeder	6	General farm hands

Fertilizer Use

Alfalfa —300 lbs. single super phosphate
200 lbs. ferric sulphate
Corn — 10 tons manute
100 lbs. nitrogen
Walnuts— 60 lbs. nitrogen
10 ton manure
Tomatoes—10 ton manure
300 lbs. 10–10–5
300 lbs. single super phosphate
200 lbs. ferric sulphate
Cotton — 80 lbs. nitrogen (ammonium sulphate)

Valuation

Have been offered $1,200 per acre.

Sunday morning the group was up at six o'clock in order to visit a beef cattle ranch located in the Coastal range near Hollister. This operation, started after the war by a young veteran and on a rented ranch, is typical of the commercial beef production in this area. It does not have the painted fences, fancy houses, or beautiful horses associated with ranches developed from oil or other income. The operator does most of the work himself but can call on neighbors for help when necessary. The table on the following page summarizes the operation.

The final stop of the tour was a visit to the Salinas plant of the Spreckels Sugar Co. Sugar beets are an important field crop in California and represent an enterprise in which sales are made through contracts. All sugar-beet acreage is under contract before the crop is seeded. The harvest had been delayed at the time of our visit, and the plant was not in operation. The agricultural engineer for Spreckels Sugar discussed the mechanization of beet production, particularly harvesting. He traced the development from the early attempts to do as good a job by topping mechanically as was done by hand and then the shift to as poor a job as

COMMERICAL BEEF CATTLE RANCH, SAN BENITO COUNTY, CALIFORNIA
Cow-Calf Program—Sell Yearlings

Land:
5,000 acres—leased at $2 per acre
400 acres—cultivated
4,600 acres—range

Beef Cattle:

Cows	200
Bulls	15
Calf crop percentage	85
Calves carried over	150
Culls sold at weaning time	
(Total 4000 an. unit months per yr.)	

Calendar:

Nov.–Feb.	Calve
May	Sell cull cows
June	Sell yearlings
August 15	Wean calves, sell light calves
Aug. 15–Dec. 15	Supplement weaners 1–2 lbs. concentrate per day
Sept.–Dec.	Supplement cows 2 lbs. concentrate per day

1955 Sales:

Yearling heifers	36 Av. Wt. 700 lbs. =	25,200 lbs. at	$18.50 =	$ 4,662
Steers	72 Av. Wt. 750 lbs. =	54,000 lbs. at	20.50 =	11,070
Cull cows	33 Av. Wt. 1000 lbs. =	33,000 lbs. at	12.00 =	3,960
Weaner calves	30 Av. Wt. 300 lbs. =	9,000 lbs. at	20.00 =	1,800
Old bulls	3 Av. Wt. 1400 lbs. =	4,200 lbs. at	14.00 =	588
Total beef sold from ranch in 1955 (Total beef sold per acre = 25 lbs.)		= 125,400		$22,080
Barley	30 tons at $45			1,350
Total sales				$23,430

Farming Operation:
Usual rotation of the 400 acres—¼ barley on a ¼ lease
¼ volunteer hay
½ summer fallow

Equipment Investment:

TD9 Track-layer tractor (with blade)	$ 4,250	Horse trailer	$ 825
Disc harrow	300	Saddle horses (5)	1,500
Other harrows	400	Saddlery, shop tools, etc.	250
Seeder	75	Cattle scales	500
Wheel tractor	1,230	Cattle squeeze	325
Power take off mower	300	Cattle self-feeders (6)	300
Sulky rake	180	Underground gas tank	110
Buck rake	100	Pickup truck	1,750
Stationery hay press (¼ share)	300	Office equipment	120
		Miscellaneous equipment	620
Total equipment investment			$13,435

Expenses:

Ranch rent	$10,000	Cattle hauling	$ 350
Feed	1,945	Personal property tax	439
Wages	1,610	Insurance	288
Maintenance of fences, etc.	1,300	Veterinarian	275
Vehicle registration, horse shoeing, brand inspection, telephone, etc.	1,240	Fuel—diesel, gas, oil	638
		Equipment maintenance, etc.	575
Replacement bulls (3)	1,050	Farming expense (seed, labor, etc.)	510
Total expenses			$20,220

you could get by with but one that was done as fast as possible. Present harvesters fall in the latter category, and the group was able to see such a machine in operation.

It had been a little cool in Berkeley when the tour left on Friday morning. On Saturday afternoon, it was 96 degrees at Los Banos when we visited the Fawcett ranch. When we arrived at Asilomar, at about five o'clock Sunday afternoon, it was foggy and cold. The group thus experienced typical sudden changes in climate that account, in part for the variety of California agriculture and its many problems.

Your committee hopes that we will again have the opportunity to show AFEA members some of our agriculture.

THE ECONOMICS OF GROWTH AND STABILITY IN THE UNITED STATES

Chairman: Sol Sinclair, University of Manitoba

GROWTH AND STABILITY IN THE GENERAL ECONOMY

SOLOMON FABRICANT
National Bureau of Economic Research, Inc.

WHETHER our economic growth will proceed more or less rapidly than in the past, whether it will proceed more or less steadily, whether it will involve a radical transformation of our economic structure as it did in the past—these are questions of great interest and concern. Indeed the questions are of such moment that no one who makes plans for the future can refuse to hold some sort of opinion on them.

These opinions, like all calculations of the future, can be based only in part on solid knowledge. This would be true if our knowledge of economic growth and stability were already what we hope it will some day be. It is all the more true when, as is the case, our knowledge falls far short of reasonable standards.

It is wise to recognize this. When we discuss the prospects for the future, we should always keep in mind what we know and do not know of our past growth and stability.

We begin, therefore, with some observations on the economic development of the United States over the past eight decades.[1] There are several aspects of this development already distinguished in our questions. Put very baldly, the major historical facts on each of these are as follows:

1. The long-term rate of economic growth of the United States, measured by real net national product, has averaged about 3.5 per cent per annum. There is some evidence of retardation in rate of growth, although it is not conclusive. With respect to net national product per capita, the average rate of growth has been about 1.9 per cent per annum. Here, the signs of retardation are even fainter and may fairly be said to be negligible.

2. Not every decade has experienced the same average rate of growth in net national product or net national product per capita. There have been long swings in the rate of growth of around twenty years in length.

3. Our economic growth has been characterized also by the shorter and more violent fluctuations we call business cycles. These have been of

[1] Professor Abramovitz's recent paper before the American Economic Association (*American Economic Review*, May 1956, pp. 5-23), on which I have leaned heavily, cites much of the relevant literature, published and unpublished. The names of Simon Kuznets and A. F. Burns are outstanding.

diverse length and amplitude. The record provides no evidence—as yet—of a secular trend or structural change in the severity of the cycles.

4. Transformation of our economic structure has accompanied the growth of national product. This transformation is visible in the changed kinds and proportions of the goods and services of which the national product is composed, and in the changed kinds and proportions of the industries that join in producing these goods and services. A certain degree of order is discernible in these changes.

Let us approach each of these four types of change a little more closely and consider what current thinking suggests about the future.

There is, first, the long-term or secular trend in net national product and net national product per capita.

When looking ahead it is useful to know that the average rate of increase in national product has been about 3.5 per cent per annum—a rate of such high magnitude that in the post-World War II period national product was 13 times greater than it had been in the 1870's. But we need to know also whether or not this rate has changed over time in any systematic way—that is, whether it has grown (been accelerated), shrunk (been retarded), remained constant, or moved irregularly.

The available figures, as I have said, do indeed suggest some retardation. The rate of growth in the first decade or two of the 80-year period covered was the highest in the record, while the rate of growth in the 1930's, toward the end of the period, was extraordinarily low. But the rates for the other decades do not cluster at all closely about a line connecting these extreme points; and the meager information we have for the period prior to 1870 does not point at the high rates needed for consistency with such a line.

The suggestion of retardation is therefore weak at best. What there is of it is surrounded by doubts, doubts thrown up by inadequacies in the original statistics and by the troublesome presence, in the relatively brief record, of the long and short fluctuations already mentioned. So far as the record goes, the choice between a long-term trend that shows a substantially constant rate of growth in net national product and one that shows a downwardly-drifting rate is not clear-cut.

What downward drift does appear in the rate of growth of net national product seems to reflect mainly retardation in the rate of growth in population. Since the Civil War—not before—population has been rather clearly characterized by a rate of growth that has diminished from one generation to another. Net national product per capita seems best described by a long-term rate of growth that neither diminishes nor grows over the decades. But I must add that no great precision is possible in identifying the rate.

If this is a fair reading of the historical record, it is evident that it can-

not offer an unambiguous basis even for simple extrapolation of past rates of change into the future. Simple extrapolation is really not a simple matter after all. The power of compound interest is such that an apparently slight difference in choice of rate of growth or rate of retardation can make a substantial difference in the levels projected even for one or two generations ahead. We might blink our eyes to this difficulty and accept as historical fact a constant rate of growth in net national product per capita and a declining rate of growth in population, both rates of growth and the rate of decline in the second one being taken equal to certain specified magnitudes. But this would not free us of all uncertainty. We would still have to question the "naive model" that is implied in extrapolating these rates.

What grounds are there for extrapolating past trends into the future? We generally ascribe our persistent increases in national product per capita to a favorable physical and social environment; particularly, plentiful natural resources and a political and economic system of law and order within which the individual efforts of an enterprising people interested in improving their economic position are exercised freely.

We know that in the past changes have occurred in both the physical and social environments, if not also in the objectives and enterprise of our people. We judge from the constancy of the trend in net national product per capita—if we accept the trend as constant—that these changes must have been either unimportant, or if important have been offset by one another or by such influences as are exerted by major wars and other large "accidental" factors. For example, those who saw the end of the frontier as a significant factor making for stagnation in the 1930's, could argue that its effect had not been apparent earlier because of World War I, and that its effect is not apparent today because of World War II and its aftermath, as well as other reasons. Those who blamed the 1930's on a coincidence of troughs of short and long cycles considered the end of the frontier to be unimportant; they would not have to explain its lack of influence today. If our judgment is that past changes in the economy have been unimportant or have offset one another, it becomes easy to assume and to assert that further changes will probably be no more rapid or radical, nor bear more strongly in one direction than those of the past, and will therefore not materially prevent the economy of tomorrow from being much like the economy of today. Those who make this assumption conclude—the logic is simple and invulnerable—that expectations of further expansion in net national product per capita at something like the old rate are reasonable.

Many of us would agree with this conclusion. But we would recognize also that it is an opinion based largely on assumptions. For we do not really know whether the changes that will occur in the future, or have

already occurred and whose effects will appear then, will, on net balance, make for the same or a larger or smaller rate of increase in per capita product. And the reason is that we do not know all we need to know of past changes in the economy or of their effects.

What we know is largely qualitative and often conjectural. During the 1930's the list of basic economic changes that people drew up was depressing—not only the end of the frontier, but also decline in population growth, technological changes making for reductions in the demand for capital, bigger industrial monopolies, more widespread and more powerful labor unions, agricultural cartels, more government in industry, incentive-defeating taxation, and so on. Today, the list might look quite different and point in the other direction. The fact is that what and how much we include in the list depends a good deal on how we feel—so much of our thinking about the past and the future is influenced by the kind of dinners we are getting. And we tend to judge the aggregate importance of changes in the nature of the economy by the mere length of the list of items included.

We have not been able to isolate the effect of any of these changes or, indeed, to measure most of them with any accuracy or completeness. For such a factor as degree of competition in the markets for goods, to provide one illustration, no adequate measure of change is yet available. We have all heard talk of the decline of competition in these markets, and this notion has found a place in some theories of stagnation. Yet the serious efforts at measurement that have been made do not support the opinion that a decline has occurred, at least since the turn of the century. Also, we seem to be less sure than we used to be about the influence on the rate of economic growth of different kinds and degrees of imperfect competition. More stress is now placed, it seems, on the competition among products as a crucial factor in advancing productivity, and less stress is placed on the competition among sellers of the same product.

I have already suggested that not everyone is willing to agree that the economy of today is essentially the same as that of yesterday. In this view the underlying forces making for retardation of growth are being offset only temporarily. Nor is everyone willing to agree that tomorrow's economy will be essentially the same as it is today. Those who disagree see fundamental changes in the economy under way, or already apparent, that will make for more or less rapid growth. When persons with these views extrapolate past trends, they first "adjust" them upward or downward in some degree. Since no more knowledge is available to them than to those who are willing to extrapolate past trends without adjustment, the amounts of adjustment are matters of opinion. This is the case even though some appeal for justification of the adjustment may be to the trend over the past decade or over some other selected and relatively

short period—a justification that must meet questions about the influence of long swings.

Let me be a bit more specific. Consider, for example, the role of technology, to which I have already referred. In the 1930's it played a part in stagnation theory in explaining—or purporting to explain—a low level of demand for capital. Today the feature of technology that attracts attention is organized industrial research. Many believe that this "mass production" of innovations will cause or has already caused a "break-through" to a new level of technical advance and a sharply stimulated demand for capital. The importance of this development has probably been accentuated in the minds of people by the exploitation of atomic energy. It contributes to the current feeling that productivity, and therefore also net national product per capita, will grow at more rapid rates in the future than in the past, and that no serious impediments to the utilization of our increased productivity will be created by a dearth of investment outlets.

When attention is focused on technology or on any other single factor it is usually assumed that other factors will not offset it. This assumption must always be tested. It is not clear, to continue with my example, how much of today's industrial research represents merely a shift from other types of research rather than an increase in the total research effort. Nor do we know what part of industrial research represents work on ephemeral changes in design and what part work on permanent improvements in product, process or material. It is a question also how much of the rise in industrial research is needed merely to maintain the past rate of increase in productivity.

So much for national product per capita. The trend of population raises still further questions. Although the evidence of retardation during the past 80 years seems clear, extrapolation or even discussion of this past trend would be hazardous for an economist when demographers keep shifting their long-term projections almost from year to year. I shall therefore leave it to them. I should mention, however, that although it is conventional to consider population and net national product per capita separately, the two are not independent. Changes in population and in its rate of increase have appeared as factors affecting net national product per capita in discussions of diminishing returns to scale, in discussions of increasing returns to scale, and in discussions of investment and savings. This variety of possible connections between population increase and economic growth is indicative of the complexity of the problem of determining their relation, and perhaps helps to explain the meagerness of our knowledge about the possible relationships.

After all these questions and doubts, there is still another point that needs to be made about our long-term growth. All estimates of our future growth must involve some assumption about the extent and effectiveness

of collective efforts to stimulate it. Even simple extrapolation of past trends involves this assumption, for such efforts have played a part in the past.

We are led to the conclusion that there is little basis for choosing a particular projection of economic growth, whether it is that of the past trend or some modification of past trends. If one must have numerical magnitudes it would seem sensible to follow the practice of the Bureau of the Census of specifying several alternatives. As I have just reminded you, however, even this has not enabled the Bureau to escape all dangers when it projects population. And it would not be easy to select the assumptions appropriate to high, low, and intermediate projections of net national product or net national product per capita. In other words, it is impossible to state the probabilities to be attached—whether by number or by qualitative adjective—to each of the alternative projections that one might offer. We may be sure only that the sum of the probabilities cannot exceed unity.

I turn now to the second aspect of our economic development, the long swings that have characterized our rates of expansion in net national product and product per capita.

When we are speculating about our economic growth over the next half-century or more, we may ignore these—provided we make sure that our speculations are not being influenced unduly by the most recent experience with a long swing. When we are concerned with the next decade or two, however, it would be far more dangerous to ignore the fluctuations. For past alternations of high and low rates of growth have not only averaged some twenty years in duration, they have also been of considerable amplitude. The average difference between high and low rates of growth in net national product per capita has been at least as great as the average rate of growth itself.

Because these swings have been subjected to little analysis as yet, we are not sure what kind of phenomenon they constitute or what their causes are. There are several possibilities. Our expectations concerning the future occurrence of these long swings hinge on which possibility or combination of possibilities we favor.

The long swings may be merely a statistical result of the effort to measure trends over periods too short to eliminate the effects of the haphazard succession of mild and severe business cycles that mar our economic growth. If this is the case—and it is not out of the question, although it seems less likely than the other possibilities—and if severe cycles are no longer to be expected, even the illusion of long cycles will vanish.

The long swings may reflect "accidental" forces not generated by the economy itself—wars are presumably in this class—the effects of which endure beyond the limits of a single business cycle. In that case, all that

an economist could say is that our prospects depend not only on economic factors, but also on the chance that such "accidents" will occur. And the economist would add that, in view of our limited experience with these accidental forces—only 3 or 4 swings have taken place since 1869—it is not possible to specify with any confidence what the probability of their occurrence may be. In this day and age, it would be well to add to this also a question. Would it be sensible to assume that the next "accident"—say, the next war—will affect economic growth in the manner and degree in which wars have affected growth in the past?

There is a third possibility. The long swings may reflect systematic forces, inherent in the economy, which generate a true long cycle. In this case, the question becomes whether or not these forces may be expected to diminish in intensity as a result of deliberate collective action or other changes in the economy. Although this is useless to speculate about at this time, one cannot escape assuming some answer to the question when one estimates developments during the next decade or two.

We come next to the question of business cycles.[2] We are all familiar with the many recent changes in our economy that bear on this question. Significant improvements have been made in our financial institutions and regulations. We have developed an elaborate governmental machinery to ease the burden of city and farm depression. The rise in incomes and prices, and other developments including the cold war, have put the bulk of incomes into the tax brackets and thus have made government a more than proportionate sharer of reductions as well as of increases in most incomes. The scale of government, not entirely because of the cold war, has grown to the point where its actions, directly or indirectly, have far greater influence than in any preceding period except wartime; and it has become the avowed responsibility of government to lessen the hazards of unemployment and business depression. Do these changes in our economy suggest that the business cycles has been eliminated?

To judge from current opinion and behavior, few of us believe that all fluctuations have been or will be eliminated.

It is in fact in the nature of a progressive economy to exhibit instability. The millions of persons whose individual efforts to improve their economic status constitute the fundamental source of our progress make their plans in an uncoordinated manner. This, along with other attributes of our economy, is bound to lead to an unsteady course for the economy at large. It is hardly likely—indeed, inconceivable in an enterprise economy—that those in authority could so accurately gauge events, and so quickly bring appropriate and coordinated policy to bear, as to smooth out completely the course of general business; or that any "automatic" machinery could

[2] I draw here, with some modification, on some paragraphs read before the Life Insurance Association of America in December 1955.

be devised to accomplish this task. Nothing we know of the nature of our governmental machinery or of the extent of our economic knowledge and intelligence would lead to the conclusion that fluctuations of modest amplitude are out of the picture. Nor would any experience we have had during the postwar decade. What we may properly ask of our governmental and monetary authorities is that their actions be sufficient to contain within limits the fluctuations that our economy may be expected to generate.

It is possible that economic conditions could deteriorate with extreme rapidity. In the ensuing scramble, especially if—indeed, because— the preceding boom had been characterized by considerable and widespread speculation, values might tumble rapidly and drag down production and employment. Should events move so rapidly, and confidence in future prices, if not volume, be severely shaken, automatic or administrative action might not be sufficiently powerful or rapid to prevent a rather severe contraction. Most of us seem to feel that improvements in our economic system and in its administration have made such a severe contraction less likely than before. And I expect that, if our people are modest in their particular demands on government, the probability of a severe business contraction could be still more lessened. But it is not entirely out of the cards. We have still much to learn of the nature of our economy; we have much to improve in our sources and interpretation of current information; and governmental authorities must be able and willing to take appropriate corrective action to prevent excessive speculation.

If such a contraction occurred, however, few believe that it would be protracted. After the shake-up in speculative values, the powerful underlying forces and machinery—and new machinery adopted for the emergency—would make their influence evident before production and employment fell to catastrophic levels. (Of course, if the contraction proceeded at a slower pace, the problem would be easier.) The contraction would be arrested.

If there is any merit in these speculations, they suggest that the chance of a deep and protracted depression is slight; that the chance of a sharp though brief contraction is smaller than before, but not negligible so long as there are some doubts about our knowledge and self-discipline; that cycles of moderate expansion and contraction will not be avoided. The boat will be kept from shipping much water in a blow, but that it will be kept on an absolutely even keel seems out of the question. The next ten years will see whether or not there is merit in these speculations.

Finally, a few words about our economic structure, which changes along with aggregate output and output per capita. This type of change occurs not only secularly, but also during long swings and business cycles. In addition, individual products and industries have been characterized by

short and long swings more or less peculiar to themselves. I shall comment only on the secular developments.

We are all familiar, for example, with the decline in the relative importance of coal in the consumer's budget and in the relative importance of coal mining as a source of employment and income. The phenomenon is general. Efforts by individuals to improve their economic position give rise to economic growth because they give rise to the development of new products, new methods, and new sources of material supply. Economic growth is therefore accompanied by divergence among industries and products with respect to rate of growth. It is accompanied also by retardation in the rate of growth of individual products and industries, for these efforts cause the substitution of one product by another and subsequently that other by still another. The retardation, though general, does not proceed at the same rate in all parts of the economy and therefore does not imply retardation in total output.

The particular directions taken by these substitutions and shifts are in part matters of chance. In part, however, they are systematic in origin. In our culture, for example, increased income is bound to result in a sharper rise in the demand for educational services than in the demand for food. We may look forward not only to further alterations in our economic structure in general, but in particular to a reduction in the relative importance of certain types of products and industries and an increase in the relative importance of other types.

These changes in industrial structure are inevitable in a growing economy. Of course, deliberate collective action—here and abroad—may interpose obstacles to the free play of the economic forces involved. Therefore, just how much change will occur, and in what direction, will depend in part on these policies. One's view of the prospects for growth, as well as one's view of the prospects for change in our economic structure, must take account of these policies.

Let me carry the last thought a bit further. The several aspects of economic development that we have been distinguishing are interrelated in various ways. This has important implications for economic policy. The policy that is most desirable is the one that makes for stability—in general, or in particular industries—without impeding growth, or favors growth without undermining stability. But we should not assume that these several goals are competitive in all respects and that to reach closer to one necessarily means departing from the others. The problem is to choose or to invent the policy that will improve us in the several directions, giving due weight to the relative values we place on improvements in each and to the values we place on changes in the noneconomic aspects of our lives.

When one makes highly qualified statements of the sort I have been making, there is danger of giving the impression that we know nothing.

In closing, therefore, let me stress that in fact we know more today about the economic development of our country than we did twenty or thirty years ago, or than students in most other countries know about their's today. The hard work of a generation of students has wrung from scanty and ambiguous materials some of the elements of an accurate description and understanding of our economic growth. Although some additions to our knowledge may be put only in a negative way, that also is an advance. It is better to know that the data do not support the assumption of retardation, to recall that question, than innocently to assume that they do. But it is better still to acquire positive knowledge.

We return to the point, at the end, that our future economic development is, in some degree, what we shall make it. And what we shall make it depends not only on our unity of purpose, not only on our discipline and enterprise, but also on our knowledge.

AN ALTERNATIVE DIAGNOSIS OF THE FARM PROBLEM

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ADMITTEDLY the farm sector of the United States is not in a good state of economic health and the public measures that have been taken to treat it appear to be of no avail. One cannot help but wonder whether the diagnosis has been wrong and the treatment inappropriate. What is especially baffling about agriculture is that the surrounding circumstances have been so favorable for good economic health.

The standard diagnosis runs as follows: the farm sector[2] is doing badly because of the very large stocks that have been accumulated. The high price supports have brought on this state of affairs. Lower price supports and acreage controls along with large disposal programs, some sales promotion, and more research—are the treatments.

Some stocks are indeed large—over a billion bushels of both wheat and corn and over 14 million bales of cotton. These stocks are excessive, burdensome and costly to store; and it is most difficult to get rid of them once the U.S.D.A. has them.[3] But these stocks do not account for the big drop in net farm income of farm operators from farming from a little over 16 billion dollars in 1951 to somewhat more than 11 billions in 1955.[4]

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[1] I have benefited from helpful criticism of Milton Friedman, D. Gale Johnson, and Albert Rees. Marto Ballesteroes checked the data and calculation. Responsibility for what is here presented is, of course, mine.

[2] It will be convenient to treat agriculture as if there were a sharp dichotomy between the more commercial parts that produce the great bulk of farm products sold by farmers and the parts that produce relatively little for sale characterized by low production per farm, where (very) low incomes have been a problem of long standing. See the U.S.D.A. report on problems of low-income farmers, *Development of Agriculture's Human Resources*, April, 1955. In round numbers there are about a million able-bodied farmers who are not part-time farmers or residential farmers but who are engaged essentially full time at farming and who produce so little that their incomes are exceedingly low. For some years a large part of our research effort in agricultural economics at the University of Chicago has concentrated on this low-income problem of agriculture. These studies have been directed in the main by D. Gale Johnson. They were made possible by two grants from the Rockefeller Foundation and by a grant from the Sears Roebuck Foundation. In this paper I shall leave this chronic low-income problem aside for I shall concentrate on the more commercial parts of agriculture.

[3] The Commodity Credit Corporation reported an investment in farm commodities of 8.5 billion dollars as of May 31, 1956. Under the Surplus Disposal Law, the government has disposed of 2.95 billion dollars of farm commodities at a loss of 1.32 billion dollars since late 1954.

[4] See *Economic Report of the President*, January, 1956, Table D-16 put this income at 10.9 billion dollars. The U.S.D.A. has revised the 1955 figure upwards to 11,680 millions. The 1951-1955 net income of farm operators from farming appearing in *The Farm Income Situation*, July 17, 1956, Table 2, page 19, are as follows:

Had these stocks not been accumulated, farm income would have dropped even more than it did.[5]

The problem of too many stocks, nevertheless, has become the main concern in policy thinking.[6] As already noted, acreages of the major crops are deemed to be too large. Acreage controls and more recently the euphonious "soil bank," thus are one of the treatments. Additional markets for farm foods has become another treatment to be had by advertising and other promotional activities. Just why more technically oriented research to keep farmers in the vanguard in their technology should be given extra play is not clear, but it too has become one of the preferred treatments.

It was already abundantly clear in the late forties that the high price supports on butter, wheat, rice, cotton, tobacco, and on some other products would sooner or later give rise to excessive stocks. The Korean affair postponed the day of reckoning. It was not foreseen, however, that more basic economic difficulties would plague agriculture. It was widely held that once the U. S. economy had successfully made the transition back to peacetime conditions the more commercial parts of agriculture, too, would do quite well. Support for this favorable outlook for agriculture was seen in the new and vigorous population growth, rising per capita incomes, and a large volume of exports of U. S. farm products—based on full employment, trade and foreign economic aid.[7]

1951	16,111	million	dollars
1952	15,120	million	dollars
1953	13,263	million	dollars
1954	12,487	million	dollars
1955	11,680	million	dollars

These estimates include both government payments to farmers and net change in farm inventories.

[5] But one hastens to add that this statement is not offered as a justification of the kind of price supports that have brought these stocks into the hands of government.

[6] Policy thinking of last few years has been mainly based on the belief that the commercial farm sector is doing badly because of the very large stocks that have been accumulated by the government. It is, of course, true, as we note repeatedly throughout this paper, that these excessively large stocks must be dealt with, but the accumulation of stocks, say, since 1951 has not brought about the low earnings of farm family workers, as we shall show. There is also the belief, widely held, that the farm problem is mainly the result of all too low farm product price because the decline in these prices has been (primarily) responsibile for the big drop in net income of farm operators from farming, already noted above. In general, however, as we shall argue, farm product prices are not out of line with their value to the economy, and, therefore, measures that would attempt to restore farm income to more nearly its 1951 level by "raising" farm product prices only would create another farm problem. The farm problem will be represented in this paper as a disequilibrium in the allocation of resources committed to farming in the United States.

[7] I must confess that I, too, had expected the more commercial parts of agriculture to manage rather satisfactorily in this post-war period provided we were successful, as we have been, in keeping the economy as a whole at a high level of

In this paper, I do three things. One, I examine somewhat more fully the standard diagnosis and several others based on conditions that could have impaired the farm economy; two, I present an alternative diagnosis of why many of the more commercial parts of agriculture are in a poor state of economic health; and three, I discuss some of the more important implications of parts I and II for public measures to treat the farm sector.

I

There are several developments that could have affected the commercial farm sector adversely: (1) the aftermath of the war, (2) instability in business activities, (3) the over-all performance of the economy, and (4) high price supports. In examining each of these in turn, the task that I set for myself is to determine why the farm sector is not functioning satisfactorily.

1. *Is it mainly the aftermath of the war and in this respect similar to the maladjustments that followed World War I?* It could be on some counts, but it would be a mistake to diagnose the current farm problem as at all similar to that which arose after World War I. The dissimilarities are many and important. The general level of prices has not fallen drastically as it did then but instead has been maintained at the new, high level that it reached during and following the war and after Korea.[8] The index of consumer prices has been unusually stable since 1951. Exports of U. S. farm products have not dropped abruptly. Farm land which was seriously overpriced during and following World War I, has not been overpriced this time. Nor have farm people incurred a large and burdensome debt as they did then. Banks serving the farm sector have not been impaired whereas during the twenties large numbers of them failed. Accordingly, it is not particularly helpful merely to say that the farm sector is faced with a set of maladjustments which are an aftermath of the war and similar to those following World War I.

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production with little unemployment and fairly stable in terms of the general level of prices. When I made this assessment, I did look upon butter, wheat, rice, tobacco and cotton as exceptions because of the high price supports, changes in foreign demands, and the way we were pricing ourselves out of the various markets especially in the case of cotton. My footnotes to the Committee Report appearing in Murray R. Benedict's story, *Can We Solve the Farm Problem*, reflect this view. See Murray R. Benedict, *Can We Solve the Farm Problem*, New York: The Twentieth Century Fund, 1955. See especially notes 20 and 21 and 25 appearing in Chapter 12, which is the report of the committee.

[8] *Consumer prices* (1947-49 = 100)

1920 = 85.7, 1922 = 71.6 1946 = 83.4, 1950 = 102.8, 1955 = 114.5

Wholesale prices (1947-49 = 100)

1920 = 100.3, 1922 = 62.8 1946 = 78.7, 1950 = 103.1, 1955 = 110.7

Prices received by farmers (1910-14 = 100)

1919 = 217, 1921 = 124 1946 = 236, 1950 = 258, 1955 = 237

2. *Is it the instability of the rest of the economy?* The 1948-49 decline in business gave rise to some economic difficulties and farm product prices declined appreciably.[9] The 1953-54 decline caused the economy to pause; but had little effect on the demand for food. Neither of the recessions in business activities had much effect on the demand of consumers for food at retail; they appear, however, to have reduced the foreign demand and also the demand for stocks by processors and others who handle farm products. The important adverse effect of these recessions on the farm sector was the increase in unemployment during each of these recessions which curtailed somewhat the job opportunities of farm people who wanted to leave farming, and so slowed down the out-migration of farm people. But this effect was not of major importance. One cannot, therefore, ascribe the present illness of the farm sector to this mild instability in business.

3. *Is there something adverse in our over-all economic growth?* Surely not, in view of the post-war performance of the U. S. economy. There is no similarity whatsoever between the circumstances of the fifties and those that characterized the thirties. We have not had mass unemployment; on the contrary, the economy has been booming and comparatively few have been unemployed even during 1948-49 and 1953-54. Nor has population growth been slow. Furthermore, no one would contend that there is widespread under-consumption in the United States, or that diets have been worsening.[10]

The demand for farm foods does not, of course, increase much as a consequence of rises in per capita (real) income, not nearly so much as do the demands for housing, automobiles and other consumer durables and for recreational, medical and educational services.[11] The income elasticity of farm foods, however, is positive and coupled with the strong upward population current, the rate of increase in consumer demand for food is by no means negligible.

It could be that the adverse effects of the thirties linger on in agriculture. But I see no evidence to support such a view except perhaps in the case of the depressed areas in agriculture where farm production and farm income are both very small and farm people are very poor.

One might also ask: What about bumper crops? Have we had a run of ideal farming weather resulting in a series of bumper crops which have

[9] Prices received by farmers for farm products (19-14 = 100) dropped from 310 in January, 1948 to 235 by January, 1950.

[10] Civilian per capita food consumption rose 5 percent from 1951 to 1955.

[11] During the middle forties I put the income elasticity of farm foods entering into food purchased by U. S. consumers at retail at about .25. It has become even lower as we have become richer. See my *Agriculture in an Unstable Economy*, New York: McGraw-Hill, 1945; and, for a more complete survey of both time series and cross-sectional data revealing consumer behavior see my *The Economic Organization of Agriculture*, New York: McGraw-Hill, 1953.

given us an abnormally large supply? Yields have been rising but for reasons other than unusually favorable weather. Has the supply of farm products been swollen by a new wave of soil mining by farmers? Here, too, the answer is in the negative. What evidence we have indicates that farmers, taken as a whole, are improving rather than depleting their soil resources.

4. *Once again, is it high price supports?* As already noted, high price supports have given us excessive stocks of a number of farm products—wheat, rice, tobacco and cotton. There is also more corn in storage than would be required to accommodate fluctuations in yields. In disposing of some of these stocks the government has undertaken various programs to subsidize their export. Some of these disposal programs have disrupted the normal trade of farmers in other countries. Accordingly, we have been engaged in dumping some of these stocks on producers abroad. It should also be noted that our high price supports have benefited some farmers in other countries; for example, cotton growers in Mexico, Brazil, Turkey, Egypt, Peru, Nicaragua, and elsewhere.

We may infer from these developments that the high price supports are responsible for the excessive stocks that this country has accumulated. But does the accumulation of these very large stocks explain the low state of economic health of the farm sector? Difficult as it is to live with existing stocks or to dispose of them, nevertheless, during the period that they were being accumulated, farm incomes were maintained at a higher level than otherwise would have been the case. We also infer that our export disposal programs have had some disrupting effects abroad. Unfortunately, the government of the United States has been much less mindful of these disruptions than behooves a major trading nation.

The high price supports, also, have delayed some much needed production adjustments. In addition, they have seriously impaired the competitive position of cotton relative to artificial fibers and to foreign produced cotton.

Nevertheless, the difficulties confronting the farm sector have roots that reach far beyond the problems created by the high price supports. The farm products on which price supports have been substantially too high represent only a small fraction of the value of the total output of agriculture. Most crops, including fruits and vegetables, have not had price supports and supplies of these have cleared the market without the accumulation of excessive stock. Animal products bulk large in what agriculture produces; these too have for the most part been clearing their respective markets at competitive prices.[12] Yet the recent economic pinch

[12] It may be held that the price supports on corn and other grains used in the main as feed have affected appreciably the total output of these animal products. I doubt, however, that the price effects of these supports have had much influence on this production, taking the period since 1951 as a whole.

appears to have been especially severe in major parts of the corn belt with its large volume of animal products.

Bad as some of the economic effects of the high price supports have been, it does not seem plausible to infer that the farm sector would be in a roubust state of economic health today, had the government eschewed all high price supports since the war.[12a]

So far then, we have found little or no help in looking for similarities between what happened after the first World War and what is happening now in the farm sector. Nor did the recessions of 1948-49 and 1953-54 work any major hardships on agriculture. They were a minor species of economic instability in an economy functioning at a high level of production with remarkable stability. We fortunately have avoided the kind of mass unemployment that characterized the great depression and this achievement has been exceedingly important to the economic welfare of agriculture as it has been to other sectors of the economy Nor have we had a run of bumper crops to upset the apple cart on the supply side. High price supports have caused us to pile up excessive stocks of some farm products. They have distorted foreign trade in particular and they have weakened the competitive position especially of our cottton and delayed some adjustments in production that are overdue. But high price supports, despite the particular problems they have created, do not explain the main economic difficulties now confronting the farm sector.

II

What then has gone wrong with the farm sector? I believe that a correct diagnosis differs sharply from those that have become standard and widely accepted and calls for treatment very different from that now being administered to help agriculture.

I propose to examine the inputs employed in farming for indications of how the farm economy has been functioning. First, what about land over the period since 1951 during which, as we have already noted, farm product prices fell about 20 percent and the net income of farm operators from farming by almost three-tenths? Land, more than any other factor used in farming, comes closest to being a non-reproducible resource specific to agriculture. One might therefore expect land to bear most of the brunt of a decline in farm product prices and farm income, provided, of course, other conditions had remained about equal.[13]

[12a] See D. Gale Johnson, "Competition in Agriculture: Fact or Fiction," *The American Economic Review*, Vol. XLIV, May, 1954, for an analysis of the economic effects of the farm program. Johnson concluded (p. 115) by noting that, "Until the year 1953, viewed *ex post*, it cannot be argued that the support and other programs have resulted in retaining too many resources in agriculture and in inducing an output substantially in excess of market demands at prevailing prices."

[13] These conditions are discussed in what follows.

But the price of farm real estate has not fallen. On the contrary, to the surprise of many, it has been rising somewhat.[14] The rates of return on investments in this asset appear to be on a par with returns on other comparable assets throughout the economy. There are no signs that the earnings and the value of farm real estate are currently substantially out of equilibrium.

One explanation for the rise in the value of farm real estate of about 6 percent from 1951 to 1955 might be that government payments to farmers tied to acreage allotments have been capitalized during this period into the value of farm land to which the allotments are attached. This seems most clearly the case for tobacco; however, the developments on this score in tobacco are exceptional and they are not altogether of recent origin. Another explanation might be that new techniques of production in agriculture have not been "land saving" but "land using" in their effects and they thus have increased the relative price of farm land. Some credence may be given to this explanation in view of the farm enlargement that is underway, although most of the increase in farm size may represent an adjustment to the marked increase in the "price" of labor relative to the price of most other inputs. A more plausible explanation is that *farm land was underpriced in 1951* relative to its earnings at that time (as were also the assets of most corporations in terms of the prices at which the shares of such corporations were selling) enough so that there has been room for some rise in land prices despite the decline in farm prices and income.

Whatever the explanation, the current economic difficulties of the farm sector do not stem from farm real estate. The value of this principal physical asset used in farming, is on the firm side and the land market is under no observable stresses or strains. Instead it is functioning very much as one would expect it to do under normal circumstances. In view of these facts, it is hard to make sense of the recently enacted soil bank, which is a measure that will have the main effect of bolstering the economic position of farm land.

Let us turn next to farm machinery and motor vehicles used on farms, the second most important physical asset on the farm balance sheet. Is there a serious mal-allocation of resources with regard to these assets? Since 1940 the number of tractors on all farms has more than tripled; the number of motor trucks has nearly tripled; the number of milking machines has multiplied four times; the number of grain combines, five

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[14] Prices received by farmers (1910-14 = 100)
July, 1951, 294. July, 1955, 237.
Prices of farm real estate (1912-14 = 100)
July, 1951, 201. July, 1955, 213.
Value of U. S. farm real estate
January, 1951, 85.8 billion. January, 1955, 91.3 billion dollars.

times, and, corn pickers were six times as numerous in 1955 as they were in 1940. Are we to infer from this rapid mechanization that the farm sector has gone overboard in allocating resources to these capital items?

Existing evidence does not support any such inference. The markets for farm tractors, milking machines, grain combines, corn pickers and for automobiles and trucks used on farms are not in distress. Farm operators, as a whole, are not trying to reduce their stocks of these capital items; on the contrary, they are engaged in buying more.[15] In the case of each of them, a new record level was reached in 1955 in the number of machines in use. The total value of this physical asset on farms increased from 15.2 billion dollars in 1951 to 17.7 billions in 1955.[16]

Despite the decline in farm product prices and farm income, it is hard to believe that there are currently too many resources committed to farm machinery and motor vehicles. Farm operators generally have been acting, and continue to act, as if it paid them to acquire even more of these capital items. There are no indications that the expectations which have led them to act this way were erroneous.

A brief examination, also, of the use of fertilizer will contribute to a sound diagnosis. It is not a capital item like farm real estate and machinery. It is a current production expense which can be adjusted quite readily to changing economic circumstances. The decline in farm product prices from 1951 to 1955 has not induced farmers to use less fertilizer; on the contrary, they have increased the amount used more than a fourth. It is true that the price of fertilizer declined a little, however, not nearly so much as farm product prices. Clearly, farmers have considered fertilizer a relatively good buy when all relevant prices have been taken into consideration. Moreover, a good case may be made to show that many farmers could still improve their "profit" positions by using additional amounts of fertilizer. True, the policy of the U. S. government of recent years of encouraging the construction of additional fertilizer capacity, by granting rapid tax amortization privileges, was ill advised in view of the large and burdensome supplies of farm products. All things considered, however, farmers are not allocating too many resources to this input. In this respect, one finds, as one would anticipate, that fertilizer is on a similar footing with other inputs that farmers buy on current account. The economic difficulties that the farm sector faces are not the result of maladjustments in inputs of this type.

Let me turn now to the pricing, value, and mal-allocation of the human effort employed in the farm sector, part of which is labor and part entre-

[15] Although the rate of new purchases is down.

[16] It is true there was a small decline from 1954 to 1955 in the total value ascribed to farm machinery and motor vehicles on farms which may imply that used farm equipment declined somewhat in price.

preneurship. The supply of this particular input has been, and continues to be, under severe economic pressure in adjusting to a rapidly declining demand for the services of this input in farming. Although the supply of this input has been contracting at an impressive rate, the contraction has been too slow and too little. The required contraction of the supply of this input, has not been easy to achieve even in an economy where people are so much on wheels and as mobile as they are in the United States. The reasons why it is so hard are several: The worker who leaves agriculture must not only enter upon a new and different occupation but as a rule must also change his residence (location). The recent, large decline in demand for workers in the farm sector has come very fast. The population growth characteristic of farm people is such that the natural replacement rate–young men and women who come of working age relative to those now employed in farming–is very high.

We have observed that the market for farm land is not disorganized; on the contrary, it is firm, it is functioning well, and the price of farm land is approximately in line with longer run equilibrium conditions to the extent that these can be known.[17] But the "market" for farm workers is not functioning nearly so well. It has been under much strain and it has become badly clogged. The market for the services of human agents in the farm sector, both for labor and entrepreneurship, does not come anywhere near being in equilibrium with current conditions, to say nothing about those that now appear on the economic horizon.

Farm employment is about one-fourth "hired workers" and the rest consists of self-employed "family workers." It must be acknowledged that the pitfalls are many when one tries to gauge the value productivity, especially of the self-employed in the farm sector.

One sign of disequilibrium is the rapid and drastic reallocation of manpower that is going on in the farm sector. According to the U. S. census the labor force in agriculture has decreased by almost 30 percent since 1940; it fell from about 9.5 to 6.7 millions in 1940 to 1955. The farm population has dropped by about the same percent, from 30.5 to 22.2 millions during this period.

Let us look first at the changes in numbers and in wages of hired farm workers. In numbers they fell a third, 2.48 to 1.65 millions from 1940 to 1951. The rise in farm wage rates, however, was more marked, in percentage terms, than was the rise in wages in industry generally. From 1951 to 1955 hired workers in farm employment did not decline further. Farm wage rates, however, by no means kept pace with the further rapid increases in wages in the industrial sector.

[17] There are some misallocations in the way some farm land is being used because of the particular price supports that are too high and because of acreage controls including those being set into motion by the "soil bank."

	Farm wage rates (1947-49 = 100)	Average weekly wages in all manufacturing
1940	30	$25.20
1951	109	64.71
1955	120	76.52
Increase in percent 1951 to 1955	10	18

Family workers in farm employment have been decreasing about as rapidly as hired workers.[18] Even so, the earnings which one might impute to the productive efforts of family workers not only have failed since 1951 to keep pace with the rise in wages in industry or with the smaller rise in the wage rates of hired farm workers, they have fallen instead. Moreover, the fall has been abrupt. By a rough test, outlined in the footnote below,[19] the apparent labor and entrepreneurial earnings per family worker have fallen from about $2,150 to $1,440 from 1951 to 1955, a drop of 31 percent.[20]

[18] The U.S. Census puts the number of family workers in farm employment at 7,060,000 in 1940, 5,408,000 in 1951 and down at 5,030,000 in 1955.

[19] One way to gauge what has been happening on this score is to assume that farm operators have received rates of return on their investment in farm real estate, farm machinery, and motor vehicles equal to the "going rates" and that what is left of their net income from farming represents the rewards received for the productive efforts of themselves and their families. We thus have,

	1951		*1955*	
	billion dollars	million dollars	billion dollars	million dollars
(1) Total value of farm real estate	85.8		91.3	
(2) Owned by farm operators (59% based on 1950 census)	50.6		53.9	
(3) Earnings on that owned by farm operators at 5%		2,530		2,695
(4) Farm machinery, motor vehicles and livestock	32.3		29.1	
(5) Earnings on this investment at 6%		1,938		1,746
(6) Together		4,468		4,441
(7) Net income of farm operators from farming		16,111		11,680
(8) Subtract the above property earnings		4,468		4,441
(9) Remainder		11,643		7,239
(10) No. of family workers		5,408		5,030
(11) Net income per family worker (9) ÷ (10)		(in dollars) 2,150		(in dollars) 1,440
(12) Decline in (11) from 1951 to 1055 in percent				33

[20] If you were to take the average of 1950, 1951 and 1952 and gauge the apparent labor and entrepreneurial earnings, per family worker, following the same procedure, this drop becomes 24 percent. I am aware that the number of family workers

Earnings for 1951, thus imputed to family workers, must have exceeded their value productivity that year. The farm sector was hardly at or near an equilibrium. Farm land, viewed in the short-run context of that time, was substantially underpriced relative to the rise in farm product prices set into motion by the Korean affair. Farm machinery and motor vehicles used in farm production, also, had a greater value productivity than they then cost. Current production inputs, too, were on the very profitable side for farm operators. Accordingly, net farm income of 1951 had in it a good measure of "windfall" gains. These substantial windfall gains, going to farm family workers (farm operators and their families) are an important clue to why the economic health of the farm sector was being over-rated at that time.

Looking back over what has happened since 1951, the following observations appear relevant:

1. The earnings in 1951 of farm family workers in the commercial parts of agriculture, especially in the North and West, appeared at the time to be approximately in line with earnings of comparable workers (in terms of abilities, age, sex and education) in the rest of the economy.

2. Since then (1951 to 1955) weekly earnings of labor in all manufacturing have risen about 18 percent. A comparable rise for farm family workers would have meant an increase from $2,150 to $2,540 in earnings per farm family worker. Instead, however, they dropped abruptly, to $1,440 in 1955.

3. This big drop in imputed earnings per farm family worker from 1951 to 1955 has been a consequence of the disappearance of the entrepreneurial "windfalls" discussed above.

4. We conclude from this that the real value productivity of the labor of farm family workers was actually far less in 1951[21] than it was for comparable workers in the rest of the economy. This gap between the two was not observed in 1951 because of the large windfall gains of farm operators as entrepreneurs. The farm sector, accordingly, was maladjusted in 1951 but it was not then apparent and economists and others were misled into a belief that resources (principally labor) were in fairly good state of allocation.

Our diagnosis thus points to a serious malallocation of labor, not only

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I have used is too large, because it includes all farm family workers and accordingly also those who are not in the more commercial parts of agriculture. It is not likely, however, that the relative change (drop in percentage terms) has been appreciably affected by this limitation in the data. Then, too, there is the income the farm population obtains from nonagricultural sources. It rose somewhat during this period, from 5.6 billion dollars in 1951 to 6.1 billion dollars in 1955. We cannot allocate the appropriate part of this income to the farm family worker. The change, however, would appear to have been too small in any case to alter substantially our results.

[21] Or if one wishes, in 1950, 1951 and 1952.

currently but also already in 1951, with too many workers (mainly family) committed to farming. We are, however, dealing here only with a symptom of the developments that have placed the farm labor force under such adverse economic pressure. The next step in our diagnosis is to identify, as best we can, these developments. We have the following:

1. There is a large natural increase in the farm population which keeps adding to the farm labor force unless offset by farm people taking other jobs. This is a characteristic of long standing, however. The estimated natural increase of farm population has been,[22]

1920-29	4,851,000
1930-39	3,848,000
1940-49	4,026,000
1950-54	1,950,000

2. The net internal replacement of the farm labor force has been, and continues to be, far in excess of the current labor force in the farm sector. This high replacement rate is, of course, a consequence of the large natural characteristic of the farm population and of its age structure and mortality.[23] Berry has studied the functioning of the labor market. His analysis is based on six variables: occupational migration rate of farm labor from agriculture, 1940-1950; farm income, 1939; farm income growth rate, 1939 to 1949; male age ratio of the farm population, 1940; index of agricultural

[22] From *Farm Population Migration to and from Farms*, 1920-1954, U.S.D.A., December, 1954, Table 6. The average yearly increase in births over deaths declined about 100,000 from the twenties to the thirties, then rose somewhat during the forties and by the mid-fifties had declined once again to the level of the thirties.

[23] When one groups the several states according to their respective replacement rates for 1940-1950, expressed in percent, with 100 representing the rate that is equal to the replacement required to maintain the then existing size of the farm labor force, we have,

Replacement rates ranging from: (in percent)	Number of states	
100-125	8	(Three New England states, New York, three Far West states and Nevada)
126-150	13	
151-175	10	
176-200	13	
201-and over	4	(N. and S. Carolina, Alabama and Utah)
167	48	(United States)

See Charles H. Berry, *Occupational Migration from Agriculture*, 1940-1950, unpublished Ph.D. thesis, University of Chicago. These replacement rates are "based on 1940 age distribution of the rural farm male population, and an actuarial knowledge of mortality. . . . The expected 1940-1950 increment to the rural farm labor force is derived from those persons aged 15-24 in 1940 who will therefore move into the 25-69 age group by 1950, less those persons aged 60-69 (1940) and the expected 1940-1950 mortality of persons aged 15-59 (1940)." Berry used Conrad Taeuber's estimates appearing in *Replacement Rates of Rural Farm Males Aged 25-69 Years by Counties*, 1940-1950. B.A.E. 1944.

concentration, 1940; and rural farm male replacement rate, 1940-1950. He concludes that the most important variable in the observed occupational migration has been the age structure of the farm population, and that the migration of younger farm persons from agriculture has been more rapid than most persons have thought. He argues further that the problem of "surplus" labor in agriculture is primarily a consequence of the very large numbers of farm people who must take other jobs to achieve any reduction whatsoever in farm employment.

3. The *quality* of workers in the farm sector has been rising. This means that workers in agriculture are better now than formerly, and, therefore, fewer workers are required to provide the same amount of labor (and of entrepreneurship). This improvement in quality has been important and widespread and yet it is missed altogether in the way we count and measure this input.[24]
4. The supply price of labor (and of entrepreneurship) has been rising relative to the price of other inputs. This development has been very marked in recent years as the economy has regained full employment. Everywhere in the economy, and surely in the farm sector, one observes that producers are substituting "other inputs" for labor as a consequence of the change in the relative prices of these inputs.[25]
5. There have been, and continue to be, important, rapid advances in the techniques of production, employed in the farm sector. *Conventional inputs*—land, labor, capital structures and current production items—as these are currently measured appear "to account" for only about one-third or less of the additional output in agriculture. The output and input changes in agriculture for various periods since 1900 seem to have been as follows shown in table on following page.[26]

The hypothesis which I have advanced[27] elsewhere to explain the large part (recently about two-thirds of the total) of the additional output in agriculture not "accounted for" by conventional inputs is that it has come

[24] This improvement in the quality of labor is, of course, not restricted to the farm sector although it may have been, and is, occurring at a more rapid rate in agriculture than in the rest of the economy because the educational and health facilities available to many farm people were far below those typically found in urban and industrial areas and because (so it appears) more gains have been achieved in some relative sense in these farming sectors than in the non-farm, say, since 1940. One should observe that we are, in the United States, allocating much capital and effort to the improvement of ourselves as people, viewed as productive agents.

[25] The usual measures of the earnings of labor and farm wage rates overstate the real rise of the "price" of this input relative to the prices of other inputs because no account is taken of the improvement in quality, already noted, unless one assumes that the quality of other inputs have also increased (about as much) and that it, too, is not taken into account in measuring the quantity of say, fertilizer, machinery, etc.

[26] From my paper, *Agriculture and the Application of Knowledge* which I prepared for a conference of W. K. Kellogg Foundation, June 21-23, 1956 held at Battle Creek, Michigan. These data, also, appear in a somewhat modified form in my paper, "Reflections on Agricultural Production, Output and Supply," *Journal of Farm Economics*, August, 1956.

[27] See my paper in the August 1956, issue of the *Journal of Farm Economics* already cited.

Period (1)	Increase in: Output (percent) (2)	Input (percent) (3)	The part of additional output accounted for by additional input[d] (percent) (4)
1900–1920[a]	25	18 to 21	72 to 84
1910–1920[b]	15	17	100[e]
1920–1930[b]	3	1	33
1930–1940[b]	16	−5	0
1940–1950[c]	20	6	30
1950–1955[c]	12	4[f]	33
1910–1940[b]	39	13	33
1940–1955[c]	35	10	29

[a] D. G. Johnson's estimates in "The Nature of the Supply Function for Agricultural Products," *American Economic Review*, Vol. 51, September 1950. For 1900–1920, the output is based on "agricultural production for sale and home use on farms;" for the other period the recent estimates of "farm output" are presented here.

[b] My estimates based on data obtained in preparing Chapter 7 of *Economic Organization of Agriculture*, McGraw-Hill, 1953, using, however, 1935–39 prices for the weights. The input series based on these weights has not been published.

[c] Same source as in footnote b above, using 1946–48 input prices as weights. This input series appears in Table 7-5 of my book. Data for 1955 are less complete estimates.

[d] With "constant" returns for additional inputs.

[e] Implies diminishing returns for the additional inputs.

[f] Based on less complete estimates.

(1) from improvements in the quality of farm people viewed as productive agents and (2) from advances in techniques of production. Moreover, the advances in techniques of production, at the level of the farm, in the main have come as improvements in the quality of the other inputs.

To summarize then, the current farm problem that is reflected in the large drop in the net farm income of farm operators, from a little over 16 billion dollars in 1951 to somewhat more than 11 billions in 1955 is not an aftermath of the war, nor can it be explained by the recession in business activities during 1953-54 or by a failure of the economy as a whole to perform satisfactorily, nor are high price supports to blame, although where they have been too high they have given us excessive stocks. The economic difficulties of the farm sector are not so much a result of a bad alignment of farm product prices, although some of them are too high, as it is a consequence of a malallocation in inputs. But farm land, farm machinery, motor vehicles and current production inputs, from an allocation point of view, are performing quite satisfactorily. The basic economic difficulty confronting the farm sector is that too many workers are engaged in farming. Earnings for labor and entrepreneurship, per farm family worker, are (far) below the earnings of comparable workers in the nonfarm sector. It is this malallocation of labor which our diagnosis reveals. The commitment of all too many workers (in the main consisting of family workers) to farming has been a consequence of several fundamental developments, namely, the continuing large natural increase in the

farm population, the very high replacement rates that this increase generates, the marked improvement in the quality of farm workers, the rise in the supply price of labor relative to other inputs, throughout the economy as a whole and the rapid advances in techniques of production in agriculture.

III

A word or two on the treatment of the farm problem may be in order in bringing this paper to a close.

If the diagnosis herein presented turns out to be correct, then certain implications by way of treatment are worth noting.

1. It is hard to believe that the level of farm stocks has much to do with the way the farm labor market functions. Merely getting rid of excessive CCC stocks *by itself* will not improve the allocation of farm workers. Nor, of course, will the piling up of still more stocks solve anything.

2. Lower price supports where they are out of line with market values will induce a better allocation of inputs in farming, including that of labor. But this treatment, while it is an essential step, will not do much in the short run to correct the badly clogged farm labor market. It will press more farm workers into the "excess supply" category.

3. Acreage allotments and controls can, and at times, have improved the economic position of farm land. They, however, do not improve the allocation of the farm labor force. They do not increase the (real or longer run) value productivity of either hired workers or farm family workers; on the contrary, they reduce the efficiency and economic contributions of such workers.

4. The soil bank is simply another variant of acreage allotments and controls. Viewed as a program to reduce the acreage in crops it will enhance the value of land while reducing the value productivity of farm work. In no way does it improve the functioning of the farm labor market. Viewed as a program to build up the soil, it will add to the supply of farm land. More farm land is not what our diagnosis calls for; nor does the projected demand for the next decade or so justify large public expenditures to increase the supply of farm land.

5. Full employment with many job opportunities in the rest of the economy is exceedingly important in correcting the excessive supply of labor in farming. A recession no more severe than that of either 1948-49 or 1953-54 adds measurably to the difficulties facing farm people who want to leave farming.

6. More and better technically oriented research and a more effective extension system to inform farmers about the results of such research, while highly desirable on economic welfare grounds in benefiting all of us as consumers of farm products, do not improve the functioning of the

farm labor market. On the contrary, these research and extension efforts increase the burden that this labor market must carry,[28] and unless it is successful in carrying the extra burden thus placed on it, the value productivity of farm workers is thereby reduced.

7. A strong case can be made for overhauling the farm employment service and the federal and state employment services generally so that they will serve, as they do not at present, any and all farm people who want to leave farming and enter upon other occupations.

8. If only a small fraction of the vast federal funds[29] that are now being expended on acreage controls, the soil bank and other farm measures—which do not improve the functioning of the farm labor market and do not increase the value productivity of farm workers but which do quite the opposite—were used to give some financial help to those farm people who can thereby be induced to leave farming, a great deal could be accomplished. I recently outlined a proposal of this type, calling it *Homesteads in Reverse*.[30] Other proposals to improve the functioning of the farm labor market may be advanced.

DISCUSSION: ECONOMICS OF GROWTH AND STABILIZATION IN THE UNITED STATES

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First I want to congratulate both speakers on their presentations; Director Fabricant for a highly competent summary of the available statistical evidence as to growth and stability in the general economy, plus a recognition of the limited adequacy of the measures of past growth and the still more limited basis for judging the future of such growth; Professor Schultz for the very effective way in which he has set forth a highly important aspect of the economic problems confronting agriculture.

Director Fabricant has summarized pertinent evidence as to the extent

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[28] Public expenditures for these purposes represent a kind of "built-in-expansion" which has been institutionalized and which adds to the over-all adjustment problem of farmers.

[29] In fiscal 1955 the realized cost of the federal agricultural programs was 1,968 million dollars of which 1,350 millions were for stabilization of farm prices and income, 319 millions for conservation of resources, 113 millions for research and education, and 186 millions for various other purposes. See U.S.D.A. *Governmental Cost in Agriculture*, May, 1956, by Frederick D. Socker.

[30] This proposal appeared first in the *Des Moines Register*, December 30, 1955.

of growth and the fluctuations in growth of the economy as a whole. He then undertakes to "examine each type of change a little more closely and consider what current thinking suggests about its future."

What Director Fabricant himself thinks will be the future trend of population and of net national product per capita I find impossible to tell, unless it be that they are highly uncertain. Nevertheless, I suspect that most of his listeners may have gathered at least two ideas as to what current thinking suggests about the future. One is that the rate of population growth will decline. The other is that the growth of net national product per capita is likely to continue unabated. Such opinions might be based, for example, on the following statements: (1) "What downward drift appears in the rate of growth of net national product seems to reflect mainly retardation in the rate of growth in population." (2) "Net national product per capita seems best described by a long-term rate of growth which neither diminishes nor grows over the decades."

But Fabricant points out that, "If we blink our eyes to this difficulty and accept as historical fact a declining rate of growth in population, and constant rate of growth in net national product per capita of specified magnitudes, we must go on to ask what grounds there are for extrapolating these beyond the present day." I gather that he finds no firm grounds for such extrapolation and yet he leaves us with the impression that the best guess is that these trends will continue in the future as in the past.

I should like to direct your attention to two points concerning the trends in the growth of our national product: (1) There is an upward bias over time in the estimates of real net national product, which Fabricant uses—though he uses the best available statistical series reflecting the long-term rate of growth of the United States economy. (2) I believe that there are pretty substantial grounds for believing that over a very long-run period, the rate of growth of the per capita net national product will decline.

Over the years of history a larger and larger proportion of the processes of attaining human satisfactions has become commercialized and hence subject to measurement. Our economy has been transformed in the past century from one in which many of the people lived on a largely self-sufficing basis, to one in which the great majority of our people buy almost all of the goods and many of the services they consume.

For example, little of the work women did 75 or 100 years ago was reflected in our statistics of national product because relatively few women were "gainfully employed." Today, on the other hand, women constitute nearly one-third of all persons employed. I suspect that no one would argue that women now work any harder than they used to, and I doubt that women's share, relative to that of men, in contributing to human welfare and satisfactions, is any greater today than it was formerly. But as

women's work has become more largely commercialized, our *measured* national product has grown accordingly.

We have no adequate measure of the extent to which changes in the degree of commercialization of women's work have increased the measured national product, but some statistics are suggestive. In 1890 women constituted only 16 per cent of the total number of "gainful workers." In July 1956 more than 30 per cent of the noninstitutional labor force was composed of women.

Another indication of growing commercialization of our life is the increased proportion of the total population "gainfully employed." In 1890 "gainful workers" constituted 34.6 per cent and in 1956 the "labor force" was 43.1 per cent of the total population. If the measured net national product per capita increased fourfold in the 75 years 1867-78 to 1944-53, how much of that has been due to the increase in the percentage of the population engaged in producing that *measured* national product?

One of the most difficult problems in assessing economic growth or development arises because such growth is not a one-dimensional thing any more than is the growth of a tree or a person. Economic growth cannot be measured adequately in terms of increase of net national product any more than can the growth of a person be measured adequately in terms of increased poundage. It makes a difference what is the change of height—where the pounds are added.

I agree with Fabricant that our knowledge of economic growth and development is in a rudimentary stage. Furthermore, I should like to emphasize that the study of economic development should be more than the recording of the history of economic change. This, Director Fabricant well recognizes, and yet I suspect that a full understanding of the dynamics of development would lead to the conclusion that within the next century the per capita output of the United States will not continue to grow at the rate it has in the past and that it may well decline.

I am not in position to give convincing support of such a suspicion, but perhaps a few questions will indicate its background. We have heard much in recent years of underdeveloped countries. What is an overdeveloped country? What is normal development? If we can find answers to these questions, the answers must presumably be related to such matters as the state of the arts and the relationship of resources to population. Perhaps at a given stage of knowledge overdevelopment of population may lead to underdevelopment of resources. Or perhaps overdevelopment of resources may lead to overdevelopment of population and in turn to such low incomes as to hinder development of knowledge.

Fabricant speaks of "major wars and other large accidental factors." To speak of wars as accidents is appropriate in his context. But in the larger

sense of an understanding of growth and development, are wars accidental? It is altogether conceivable that they may be the results of certain sorts of economic growth, or perhaps the means by which economic growth is sometimes attained. Again, under other circumstances, they may put an end to economic growth of a country.

Professor Schultz's paper perplexes me. In large part, it would seem to be a most excellent lecture for a group of students taking an elementary course in the economics of agriculture. It is thought-provoking. It is oversimplified. Some statements, though effective in commanding attention, are inaccurate or misleading and need later qualification, modification or correction to provide a well-rounded treatment. Such procedure is common in class lectures in the early stages of a course. But this is a learned society meeting—a meeting of people whose main professional concern is with the economics of agriculture.

Schultz knows this fully as well as I do. Furtherfore, I know, as do all of you, that his perspicacity should not be underestimated. It can scarcely be overestimated. Why, then, does he speak to us in this manner? Perhaps we are not the real audience for which he has written. Perhaps it is his way of stressing certain points he thinks we have not adequately evaluated.

In these circumstances, perhaps my best course is to start some critical probing in the hope that before the session is over some of my perplexities will be resolved.

Schultz says that commercial agriculture is admittedly not in a good state of economic health. At this point I must ask two questions. Admitted by whom? What is the evidence of ill health? To the first question I find no answer in the paper. The evidence which Schultz gives of ill health is "the big drop in net farm income of farm operators from a little over 16 billion dollars in 1951 to somewhat more than 11 billions in 1955."

I would be disposed to agree that such a drop of income may well be taken as an evidence of "ill health." Likewise, I would agree that if a person's temperature drops from 106 degrees to 96 degrees there is evidence of ill health. But is the process one of worsening or of improvement in the health of the patient? It depends in part upon what, if anything, is normal and what may be expected in the future. Is the change a part of the process of getting well?

As this audience well knows, there are many different comparisons of farm income that may be used. I should like to compare incomes of the five prewar years, 1935-39, with those of more recent years. In 1955 total net income of farm operators from farming—the series Schultz uses—was 238 per cent of its 1935-39 average, while *per capita* net income of farm

operators from farming was 315 per cent of the 1935-39 average. In the same year per capita net income of persons on farms—which includes their income from nonagricultural sources—was 351 per cent of the 1935-39 average.

Of course these dollar incomes are measured by a shrinking yardstick—a dollar whose purchasing power has declined during and since the war. But in terms of dollars of constant purchasing power people in agriculture are much better off than they were before the war. The per capita income of persons on farms in terms of purchasing power was nearly 60 per cent higher in 1955 than the average for 1935-39. On a per farm basis, net income of farm operators from farming had, in 1955, over 40 per cent greater purchasing power than in the 1935-39 period.

There is far more reason to take the years 1935-39 as representing a normal level of real income of agriculture than to use 1951 as that normal. Nevertheless, I do not hold that the 1935-39 average of real incomes should be considered an approximation of normal for a prosperous post-war period. Rather, we should expect the normal income per person in agriculture to have increased to about the same degree as the income per capita of the nation as a whole. The 1955 per capita net income of the total population of the United States and of the farm population are both estimated by the AMS at 351 per cent of their respective 1935-39 averages.

Schultz indicates that "the standard diagnosis" of the poor "economic health" of the farm sector is that it results from high price supports. That is surely an opinion popular in some quarters. But the term "diagnosis" is commonly used to refer to a carefully considered opinion of someone presumed to be competent to judge the cause of an illness. If Schultz means that this is the standard diagnosis by agricultural economists of why farm incomes fell from 1951 to 1955, then I am forced to the conclusion that one of us is out of touch with the current thinking of our profession.

Whether or not agriculture may properly be described as being in a poor "state of economic health" must surely depend upon our interpretation of the meaning of the expression. If agriculture is in a poor state of health it is not analogous to a person who is sick from a simple, specifically-caused and well-recognized disease such as smallpox, measles or polio. The distress existing in agriculture is a much more complex thing and is not to be attributed to any single cause.

According to Schultz ". . . the current farm problem that is now revealed as a result of the large drop in the net income of farm operators, from a little over 16 billion dollars in 1951 to somewhat more than 11 billions in 1955 is not an aftermath of the war. . . ." My contention, however, is that a large share of the decline of farm income from 1951 to 1955 has

been an aftermath of war—of World War II and the Korean War. Two sorts of things have been involved, the end of direct effects of the wars upon the demand for our agricultural products and the effects of the war-generated inflation. The fact that the courses of prices both of agricultural and nonagricultural products since World War II have been very dissimilar to their courses following World War I is no evidence that the 1951 to 1955 decline of agricultural prices is not largely an aftermath of war. The course of agricultural exports and the relative movements of retail prices, wholesale prices, "farm" prices, railway freight rates, and marketing margins all point to the importance of direct war effects and of inflation influences in contributing to the decline of farm product prices. The difference in the course of the general level of prices as compared with the period after World War I results primarily because this time we have not had a serious spasm of industrial underproduction.

Schultz does well to direct attention to the relation of inputs in agriculture to its distress and to the correction of that distress. In order to meet the changes in the demand for farm products at the "farm gate" level, it is essential to readjust inputs. Furthermore, as Schultz points out, there have been rapid advances in techniques of production that also call for changes of inputs. He is to be commended, too, for his attempt to relate past and needed changes in inputs to evidence as to their marginal productivity. His procedure and conclusions may, however, be questioned at a number of points.

The procedure of estimating labor and entrepreneurial earnings allocates to them a residual. From net farm operator earnings, 5 per cent of the value of farm real estate owned by farm operators and 6 per cent of the value of other farm capital are deducted. The earnings attributed by Schultz to real estate increase by 7 per cent from 1951 to 1955 although, according to estimates of the AMS, net rent to nonfarm landlords decreased by 17 per cent during the same period. What point is there in suggesting that earnings and value of farm real estate are currently in equilibrium? They are not supposed to be in equilibrium with *current* earnings. On the one hand we have the theory that land values should equal the discounted value of expected future earnings, and on the other, ample statistical evidence that changes in land values lag behind changes in earnings of land.

Schultz indicates that the increased use of fertilizer and machinery and equipment is evidence that their marginal product has been more than their marginal cost. In like manner the decrease in number of farm operators may indicate that their marginal product has been less than their marginal opportunity cost of staying in farming. However, one may well ask whether or not the conditions of competition (in the light of price

supports and acreage and marketing restrictions) have been such as to warrant the usual implications of these deductions. The controls have, for example, caused it to be profitable to use fertilizer where it would not have been profitable to do so in the absence of the price supports and acreage restrictions.

Schultz's diagnosis that "The basic economic difficulty confronting the farm sector is to be found in the fact that too many workers are engaged in farming," is correct, I believe, if we interpret it as referring to the difficulties confronting agriculture *internally* in meeting the changes required because of shifts in demand and the adoption of new techniques. "Too many farmers" however, is no new idea as to a cause of chronic agricultural distress.

THE STRATEGY FOR ECONOMIC GROWTH AND STABILITY

Chairman: C. C. Davis, San Marino, California

POLICIES FOR ECONOMIC GROWTH AND STABILITY

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TEN years ago I have no doubt that the subject of this discussion would have been "Economic Policy for Stability," period. The addition of the words "and growth" is a step in the direction of realism and balance. But the addition of these words also changes and complicates the problem greatly.

There is, of course, one sense in which the addition of the words "and growth" does not essentially change the problem. We can interpret the objective of "stability and growth" as meaning simply that we are trying to moderate fluctuations of the economy around a rising trend that is given by the increase in population and productivity. The addition of the words "and growth" may only make explicit what I think was always implicit, that we are after steadiness in a rate of growth.

The problem changes, however, when we say that our objective is not only to achieve steadiness in a long-run rate of growth that is given or permitted by external factors but also to do something about the rate of growth itself. This is the sense in which I am interpreting today's topic and the general drift of current discussion. Our objective is not only steadiness about some independently determined upward trend, but also the trend itself.

There are several important differences between stability and growth as objectives of national policy, all of which seem to make discussion of growth much more difficult.

1. We have a fairly good idea of what we mean by stability, but not of what we mean by growth. Stability means lowness of unemployment and absence of either sharp or cumulative movements of general levels of prices. This is not a precise definition, but it is good enough for all practical purposes.

There is no similarly accepted convention of what we mean by growth. We talk about increases in output, capacity to produce, resources, consumption, in the aggregate, per capita, per unit of input, or per man-hour. These are all aspects of growth, and for some purposes it is unnecessary to distinguish among them. But for some policy purposes it is necessary to

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distinguish, and there is no agreement on which concept of growth we really mean when choice is necessary.

2. We have a fairly good idea of how much stability we would regard as a reasonably satisfactory performance, but we do not know how much growth we would regard as reasonably satisfactory. In a general way we can say that the stability performance of our economy in the first half of this century was quite unsatisfactory but that the performance in the past five years—mid-1951 to mid-1956—was satisfactory. Possibly we can improve on the record of the past five years, but I doubt that there would be much willingness to pay any substantial price to achieve a lower average level of unemployment or smaller general price fluctuations.

But how much growth do we want or regard as satisfactory? We seem to be proud of the rates of growth achieved in the U. S. in the past century. Does the present emphasis on growth as an objective of national policy mean that we no longer think our historical growth rates were fast enough? Or does it reflect a great concern about our ability to sustain our historical rates of growth? Or have we concluded that our historical growth rates although good enough for the past, must now be substantially exceeded, perhaps for reasons of national security?

These questions of amount are important for consideration of policy. We should clearly be discussing quite a different range of policies if it is imperative to double our past rates of growth than if it is satisfactory to continue past rates.

3. Most objectives are served by a variety of policies and most policies serve a variety of objectives. However, it is possible to isolate particular policies as having a special relation to the objective "stability." These are policies that have much more to do with stability than anything else does and much more to do with stability than they have to do with anything else. Specifically, in my view economic policy for stability is monetary and fiscal policy, other means being distinctly secondary for this objective and monetary and fiscal policy is policy for stability, other objectives being distinctly secondary for these instruments.

The situation is entirely different with respect to policy for growth. The list of government policies that have something to do with economic growth is long. Some of these policies seem to be more important for growth than others, but it is not possible to select a short list of policies that have clearly much more to do with growth than other policies do. Neither is it possible to select a list of policies that are much more important for growth than they are for other objectives.

This difference may reflect simply ignorance about the quantitative relations among particular policies and growth. I don't believe, for example, that we have even the vaguest idea of how many points would be added to the average annual rate of increase of output per man-hour

by an increase of $1 billion in annual expenditures for education. There are some cases in which we don't even know the direction of the effect of policies that we feel are significant for growth.

Possibly if we knew the magnitude of the effects of various kinds of policies for economic growth we could identify a few as being crucial or sufficient for economic growth. But I doubt this, for various reasons which would carry us unnecessarily far afield. The main point now is that we don't know.

All three of these differences mean, in my opinion, that we cannot have an economic policy for growth in the same sense as we can have an economic policy for stability. Stability policy consists of the use of a few selected instruments almost exclusively for the purpose of achieving a fairly well defined and measured goal. In the case of growth we do not have the defined and measured goal or the instruments dedicated to its achievement.

What we can have is an attitude towards growth. In considering all kinds of policies we should give due weight to their effects upon growth as well as to their other effects. What due weight means is not clear.

On this view an assignment to discuss economic policy for growth is not much different from an assignment to discuss economic policy in general. I would be unable to make good on this assignment even if you had allotted me much more time than you have. However, I shall say something about a few arbitrarily selected aspects of the subject after taking up the problem of stability.

Economic Policy for Stability

We have today a fairly clear and generally accepted picture of *a* policy for stability. The main question about stability policy is: What's Wrong with This Picture?

The picture has the following main elements:

1. There is some rate of total money expenditure for goods and services that is adequate to maintain high employment without inflation. This rate rises through time as labor force and productivity rise.

2. Among the factors that influence total money expenditure the government controls three important ones—the amount of the government's own spending, the level of taxation and the degree of monetary ease or stringency. Other things equal, total money expenditures will be higher the higher are government expenditures, the lower are taxes and the easier are monetary conditions.

3. These three government influences can be managed so that in combination with other determinants of expenditure they produce the desired rate of total money expenditure.

4. When we are experiencing inflation, or when inflation is forecast,

monetary conditions should be tightened, and eased for recession.

5. Federal revenues automatically rise when national income and business activity rises, if tax rates are not changed. Revenues decline when national incomes decline. Certain expenditures, notably for unemployment compensation, automatically rise when unemployment rises and vice versa. These built-in tendencies are stabilizing and should not be prevented from working by cutting tax rates relative to expenditure programs in a boom or raising tax rates relative to expenditure programs in a recession.

6. In some circumstances, defined by the seriousness of the situation and the confidence of the forecast, tax rates should be cut and/or expenditure programs increased to cope with a recession, and vice versa to cope with inflation.

I have described this policy in quite general terms. It is only in such general terms that we can be said to have a policy that is widely accepted. Many variants of this general policy are possible, depending, for example, on the relative reliance upon monetary policy as against budget policy, upon automatic effects as against discretionary action, upon expenditure changes as against tax changes, and so on. However, I shall have to confine my discussion to the general approach.

The main question is whether or not the effort to stabilize total expenditures by means of monetary and fiscal policy is likely to result in reasonably high employment and stable price levels. There is a certain reluctance to give an affirmative answer to this question. After all, so many people were so badly burned by the New Era talk in the 1920's. This seems to me nothing but superstition, a superstition I do not share, even though I have my fingers crossed as I say so.

Reluctance to accept the adequacy of the monetary-fiscal approach to stability may also be due to intellectual pride. It is such a simple approach. And does it not show a degree of simple-mindedness to believe that such a simple remedy can cure such a serious and persistent disease? However, reliance upon government's monetary-fiscal policy to achieve stability is not denial of the great number and complexity of the forces that influence the stability of the economy. It only means that they are crucial because they are manageable and because they can be combined in such a way as to offset or compensate adverse net results of all the other forces. There is no *a priori* reason to reject this approach as too simple.

There are, however, some real questions about the adequacy of the monetary-fiscal approach. In the first place, the approach assumes that there is some rate of total money expenditures that will give both high employment and price stability at the same time. Monetary-fiscal policy

by itself will not be sufficient if the level of total demand that is just adequate to maintain high employment is too high to avoid inflation.

This is the familiar dilemma of stabilization policy. It can arise in either of two general ways—either through overly aggressive price-wage behavior or through immobility and rigidity. In the first case the degree of competition is insufficient to deprive businesses and labor organizations of the power to raise prices or to raise wage rates faster than productivity under conditions of high employment and they use the power to cause a general increase of prices, either steadily or spasmodically. In the second case, while total demand is just adequate, there may be a poor fit between the pattern of total demand and the pattern of potential production. For some industries and products demand is excessive and prices rise, but prices do not fall where demand is deficient.

The evidence of the past ten years is unclear on whether or not either of these conditions exists in the modern U. S. economy. We have had plenty of inflation. But almost all of it came in two waves, 1946 to 1948, and 1950 to 1951. Both of these were periods of obviously excessive demand—that is, demand larger than was necessary to maintain satisfactorily high employment.

The most significant period is that extending from the end of 1951 to the present. For the whole period unemployment averaged 3.6 per cent of the labor force. It was not above 5 per cent in any year. It is doubtful that there were any times during that period when a significantly smaller level of total demand would have been consistent with high employment; certainly they were not numerous or protected. The period included one moderate recession followed by a vigorous recovery.

From the beginning to the end of this 4½-year period the consumers' price index, which seems to me the most significant measure of inflation, rose by only 2 per cent.

This experience is certainly encouraging for the possibility of maintaining reasonable price stability with high employment. It is not only that the over-all price index remained remarkably level. The divergent movements of important groups of prices within the over-all index is also significant. The rather glib assumption that prices never decline in the modern U. S. economy finds little support in the evidence. I do not need to remind this audience of the decline in farm and food prices, which might have been regarded as unlikely for political reasons alone. But there were also sizeable declines in the prices, at retail, of automobiles, electrical appliances, house-furnishings and apparel made of synthetic fibers. We were able to accommodate substantial rises in the prices of services and rents without an increase in the over-all price level.

Although the experience is encouraging it is not conclusive. The main

reason for doubting that this experience can be projected into the future is that the five years of stability followed nine months of rapid inflation from the Summer of 1950 to the Spring of 1951. This earlier upsurge of prices may have made possible the subsequent stability by creating a cushion to absorb future increases in costs. Moreover, the balancing out of price increases and price decreases may have reflected special circumstances that are unlikely to be repeated. Even though retail prices did decline in some other sectors, it was mainly the decline in farm prices that offset rising industrial and service prices. Perhaps we can only get over-all price stability at high employment if farm prices fall at a rate that cannot be regarded as normal for a high employment economy.

There is, of course, a rebuttal to this reply and a rejoinder to the rebuttal. I shall not attempt to trace the argument further. It would bring us, in my opinion, no closer to a conclusion. My hunch is that the rate of unemployment at which prices start to rise is, under present institutional conditions, close to the rate of unemployment that we would regard as fairly satisfactory. Which rate is higher is the crucial question. There is a good chance that the price-raising rate of unemployment is less than the satisfactory rate, in which case there would be no problem, but there are no visible natural forces in the economy to preserve this relationship. Therefore, we must consider what might be done if prices tend to rise persistently when unemployment is at or above a satisfactory level.

I am afraid that aside from hoping that the problem does not exist, we can do no more at present than suggest the general lines along which a solution might be sought. These are, in my opinion, two:

1. Increase the slack in the economy by means that do not entail substantial involuntary, uncompensated unemployment. This includes accelerated rise of productivity, mobility of labor, flexibility of the labor force and reduced costs of carrying excess capacity and excess stocks.

2. Reduce the tendency of prices to rise under tolerable conditions of slack in the economy. Barring far-reaching institutional changes, this seems to boil down to self-restraint by business and labor.

Whether stable prices and high employment are compatible or not is one of the main questions about the fiscal-monetary approach to stability. The other main question is whether or not this approach can deal adequately with a possible deep depression. Our experience with the New Economic Policy has been limited to two minor recessions. The ability of monetary-fiscal policy to handle a major depression is still largely on paper.

This question implies, of course, that there are certain situations fated from birth to be major depressions by contrast with those destined to be only minor recessions. It means that major depressions are not just minor recessions that have been allowed to get out of hand. Unless this is true

our ability to keep minor recessions minor will be sufficient to prevent major depressions. I suspect that we do not really know whether it is true or not.

Conditions can be described that distinguish a major depression from a minor recession. The main point would be a "drying up of investment opportunities," with the result that even at high employment and even with substantially eased financial conditions the rate of investment would fall drastically. This seems to me to describe not only a major depression but also one that is resistant to monetary policy and to fiscal measures that maintain or stimulate consumption. I think there is a real question that such conditions actually exist.

However, it would obviously be unfair for me, even if I believe it, to discuss the adequacy of monetary fiscal policy on the assumption that the steps taken in 1949 and 1953-54 will always be adequate. Suppose much stronger measures are needed. Will the existing monetary-fiscal policy for stability provide them?

The monetary-fiscal policy I have described in general terms includes measures of great power. It is difficult for me to visualize a deficiency in private demand that could withstand the cuts in taxes that are arithmetically possible from present rates, especially if we are prepared to monetize the resulting deficit. And if, despite my difficulty in visualizing it, there is still need for more, expenditures can be raised.

The main problem, in my opinion, is not the existence of a limit to the power of monetary-fiscal policy but of willingness to use it in strong doses and of knowing when to do so. Although tax rate reductions helped to limit the recessions of 1949 and of 1953-54, neither was a pure case of tax reduction adopted as a stabilization measure. The tax reduction enacted in 1948, which went into effect just at the beginning of the recession, was justified by its proponents chiefly on the ground that we could afford it because there was a budget surplus. The stabilization argument was used both for and against the 1948 tax reduction, but much more effectively against it than for it. That we would have had the tax reduction without the surplus seems quite doubtful.

Taxes were reduced in the early part of 1954 despite the existence of a budget deficit. But it should be remembered that the largest part of the tax reduction occurred automatically under existing law, some of it then three years old. Positive action would have been required to prevent it. Moreover, government expenditures were falling rapidly. The administration could and did argue that it was reducing both taxes and the deficit. The tax reduction was explained not as a means to deal with a recession already in process but as a means to avoid too precipitate an approach to a balanced budget.

Thus we cannot be quite sure of the willingness of government to make

a significant tax cut when the result would be to create or enlarge a deficit and when the only reason for making the cut is to deal with a depression, actual or forecast. There is a natural reluctance for an administration to take a step implying admission that the economic situation is pretty bad and is not likely to get better without strong action. This is especially true in the present state of economic forecasting, when it will rarely be possible to prove that things will not get better.

I think the story of the period 1929-1932, as told in Mr. Hoover's memoirs, is instructive in this connection. In reading this story, I find it hard to believe that the Hoover Administration would not have taken strong action if it had known how deep the depression would otherwise go. I also think that the Administration would have known or learned what to do. But repeatedly in 1930, '31, and '32 the Administration came to the conclusion that the decline had reached bottom and was about to be reversed. In retrospect it appears that only exceedingly great confidence in prosperity as the natural state of our economy could have produced such forecasts.

I recall this history because I think it suggests the only conditions in which a serious depression is any longer possible. I am not thinking of a depression like that of 1929 but of one substantially worse than the recessions of 1949 and 1953-54. Faith is growing that natural forces, plus built-in stabilizers plus monetary policy will keep recessions shallow and short. Although, when pressed, almost anyone will concede that circumstances might exist in which deliberate measures to create a deficit would be necessary, there are many to whom such action would still seem illegitimate. I can imagine a government repeatedly postponing strong fiscal action it dislikes on the ground that the situation is going to get better anyway, just as a man may put off getting his tooth fixed because it stops hurting whenver he gets near the dentist's office. Political sensitivity to the existence of unemployment is probably so great that inaction would not be continued very long, but it may still go on longer than would be wise.

There is no completely satisfactory way to avoid this problem, because there are dangers on the other side as well. We do not want the government jumping in with strong fiscal action whenever a small cloud appears on the economic horizon. Therefore, we do not want to destroy the remaining sources of resistance to a natural temptation to spend more and tax less. I believe that certain conventional rules could be prescribed to reduce the danger of large, cumulative errors, even though they would foreclose the possibility of ideal adjustments in some cases. Such a rule might specify that we would take positive fiscal action whenever unemployment hits, say, six per cent, even though we may forecast that things are getting better; it would also bar positive fiscal action—but not mone-

tary measures—if unemployment is less than the same percentage, even though we may forecast that things are getting worse. However, I see no likelihood that responsible officials will accept any such suspension of their right to use their best judgment. In this case we must seek what progress we can along the lines of improved forecasting, greater flexibility and more realistic appraisal of the consequences of fiscal actions.

I feel that I have dealt but a glancing blow to the problem of stability. Time requires me to hurry on to economic growth. But I do not like to leave stability on a note of unanswered questions and unsolved problems. These are the most interesting aspects of the matter. They should not, however, obscure the great progress that has been made.

Economic Growth

My early remarks have indicated my reasons for thinking that policies for economic growth cannot be analyzed in any comprehensive and systematic way, except possibly in quite formal terms. However, I should like to discuss some aspects of the problem that seem important to me, on the assumption that we are concerned with maintaining or moderately improving past rates of growth.

A crucial element in the past growth of the American economy has been the strong desire of the individual American for his own economic advancement and his freedom to do something about it. A major difference between present and prospective conditions and the conditions prevailing during most of our history of rapid growth is the much greater influence of government in economic affairs. This is a natural and to some extent an inevitable development, although questions can of course be raised about many particular extensions of government activity. It does, however, create a new situation for economic growth. When government was less influential the desire of individuals for their own economic advancement was directly translated into action, which was in general well-informed action. But the desire for economic growth may not be so readily translated into government policy, for two reasons.

a) The government may not assign as high a priority to economic growth among its goals as the people give it among their goals. The difference between a larger and a smaller rate of growth is not likely to be very noticeable in a period of two or four years. The connection between government actions and the rate of growth in a similar period is likely to be even less obvious. Therefore the government may conclude that it has less to gain, in the way of credit and votes, from promoting economic growth than from promoting other more immediate objectives.

b) The connection between government actions and economic growth is often indirect and complex. This creates the possibility of error in

judging the effects of particular measures upon growth and of inadvertently adopting measures that retard growth.

The rate of economic growth will continue to depend upon thousands and millions of private decisions. But to a larger degree than heretofore it will also depend upon government decisions. This public area is likely to be the critical one, in the sense of the area in which success is less assured, in the years ahead.

One of the main ways in which government can contribute to economic growth is by helping to maintain economic stability. In my opinion there need be no serious conflict between stability and growth if the following conditions are met:

(1) The means used for promoting stability are indirect and general in their impact upon the economy, such as the monetary and fiscal policies I discussed earlier.

(2) We recognize that inflation, as well as depression, is unfavorable for economic growth.

(3) We do not set our full employment goal too high. We should try to reduce frictional unemployment by reducing the frictions. But an attempt to achieve too low a goal of unemployment, either by protecting particular industries or by pumping up the whole economy, would cause inefficiency or inflation or both.

The dynamic processes of growth undoubtedly cause fluctuations in various sectors of the economy. Also the fluctuations themselves may be helpful at some times in creating an atmosphere that encourages expansion and at other times in creating pressure for cost reductions. But I see no reason to believe that the inevitable or beneficial fluctuations in particular sectors cannot be accommodated within a reasonably stable over-all total.

Education

Any discussion of policy for growth must include reference to policies for education. Education and economic growth are intimately related, in a number of ways. Education increases the skills of the population, promotes advance of science and technology and may improve the many public policies that to an increasing degree influence the rate of economic growth.

Obviously when we talk about education we refer not to the schools alone but to all the institutions and circumstances that affect peoples' attitudes and capacities. But it is through the schools that deliberate public policy for education is most effectively expressed.

The problem of the schools may be divided into two parts:

1. Providing education of the present standards for the rapidly rising population of school age.

2. Continuing the improvement in the amount and quality of education that has been going on since the beginnings of the Republic.

Just to keep up with the expansion of the school-age population requires a more than proportionate increase in school expenditures; a twenty per cent rise in school population requires an expenditure increase of more than twenty per cent if standards are to be maintained. The amount of new construction required when the number of students is rising rapidly is obviously much greater than the amount needed to care for a relatively stable school population. Moreover, to attract an adequate supply of teachers their salaries must rise at approximately the same rate as salaries in other occupations.

As a very rough estimate, it might be said that an annual increase of between $500 million and $1 billion in annual public school expenditures will be needed to maintain existing standards. Whatever the right figure may be, two things about it are clear. It is not beyond the capacity of an economy with a current annual production of $400 billion that may be expected to rise by over $15 billion a year. At the same time, the amounts are so large in relation to the budgets of the state and local governments, which are primarily responsible, that they will not be forthcoming without acute public realization of the need.

The requirements of economic growth will not be satisfied merely by holding our own in the field of education—merely by keeping up with the increase in the school-age population. We need to plan for lifting our standards of education. This, of course, raises additional financial problems. It also raises a number of other problems.

Throughout our history it has been possible to measure progress in education by the number of years and days spent in school per child between the ages of 5 and 17. It could be assumed that the more years the average child spent in school the more and better the education. We have now reached, for all practical purposes, the goal of universal school attendance for children between the ages of 5 and 17. What directions should progress in education now take?

One obvious direction would be an increase in the proportion of the population receiving higher education. Undoubtedly this proportion will increase, and this will be a good thing. But it would be of doubtful wisdom to establish anything like universal higher education as a public goal. Everyone must reach some point beyond which more years in school serve neither his own interest nor the nation's; for most people this is probably reached at the end of high school.

If we look a reasonable number of years ahead it becomes clear that we cannot "improve" education by increasing the number of years of school attendance per capita at the same rate as in the past. To an in-

creasing degree, improvement of education must take the line of producing more education per year spent in school.

This brings us to the border of questions of educational philosophy and technique on which I am not competent to speak. It seems clear that better education will require more money. It will require better teachers, which is one of the main objects for which more money should be spent. But more money and better teachers will not be enough; we also need better ideas about what the schools are supposed to do.

One of the most common criticisms of our educational system today is that it fails to turn out more scientists and engineers. This deficiency does not seem to be the result of too few years being spent in school and college. Rather it results from too small a proportion of the persons who go through the educational system developing interest and competence in science. In part this is due to a deficiency in quality in education, particularly at the high-school level, in that scientific interests are not stimulated. It partly stems also from the fact that some high-school graduates who have the interest and intellectual ability to become scientists do not have the financial ability to attend college. If there is an inadequate supply of scientists it may also result from the failure to provide incentives to scientific pursuits commensurate with the social evaluation of the need.

Research

The amount of money and effort now being devoted to reasearch holds out great promise for the future growth of our economy. There is, however, a question whether or not this research effort is now being exerted in ways that will yield the maximum results.

Much of our present scientific research is carried on as part of planned research programs of large institutions—the federal government, large corporations and a few large private nonprofit research centers. Quite likely without this development we would not have had so rapid an expansion of the research effort as has actually occurred. At the same time certain possible disadvantages of this situation should be recognized:

1. There may be too much centralization in the decisions about what should be studied. The variety of ideas that gets studied may not be so large as we could and should support with the resources now being devoted to research.

2. The institutional process of planning research may be unduly conservative. Research directors may be reluctant to spend large amounts of other peoples' money—especially money appropriated by government—on long shots, even though the pay-off for success may be great. They may prefer the safer course of concentrating on projects that are relatively sure to result in some advances, even though small.

A possible consequence of these two conditions would be failure to get the basic research on a wide variety of fronts that is likely to yield unplannable but great break-throughs of knowledge.

The Incentive System

The desire for individual economic advancement has been a strong driving force for economic achievement in America because there has been a direct connection between an individual's economic achievement and his economic status. The difference between the rewards of success and the penalties of failure were great.

Certain things can properly be done to moderate the penalties of the system. The ideal approach is to increase the opportunity of more people to function effectively in the economy and earn satisfactory incomes. This can be done through education, improved health services, reduction of racial discrimination and many other means as well as by general measures to maintain a prosperous and expanding economy. In addition we can go farther toward establishing a floor below which family incomes cannot fall.

Moreover we can and do moderate the extreme rewards of the system, through progressive income taxes and through estate taxation. Here, in my opinion, there is least to accomplish and most to lose—the greatest danger of retarding growth without effectively serving any important purpose. I believe that the federal tax system has already gone too far in this direction. Certainly no one can gain much and everyone has much to lose from the effects on economic growth of present extremely high tax rates on the relatively few large incomes which serve as goals for many people, most of whom will never achieve them.

Mobility

The history of American economic growth is a history of movement. Labor and capital moved from declining industries into industries producing more desired products by more efficient methods. This movement was often painful, but it was necessary. We want to reduce the pain, but not to eliminate the mobility.

The essential condition for maximum mobility with minimum pain is to maintain a prosperous and expanding economy. It is much easier to move when attracted by new and better opportunities than when driven by the disappearance of old ones.

Measures undertaken for the assistance of distressed or declining industries should be definitely transitional and self-limiting, to provide time for resources to adjust but not to prevent adjustments, or make them

unnecessary. This is the rationale for gradualness in tariff reduction. It is also an important principle for the guidance of agricultural policy.

Government policy can do much to reduce barriers to labor mobility—notably through reduction of ignorance and elimination of racial discrimination.

The Flow of Savings

If we maintain high employment there is little question that the total flow of savings will be large. The size of this total flow is important for the rate of growth. The direction of the flow is also important, and on this point it is not possible to be so confident.

Savings can flow in any one of three directions:

(a) financing innovating, venturesome investment,

(b) financing an expansion of the capital stock of existing forms, or

(c) financing government deficits.

The flow in the first direction is the most valuable for economic growth. But even though the total supply of savings is large it is possible for the flow in this critical direction to be inadequate. The savers may be so anxious to avoid risks that too little funds will be available for new, risky productivity-multiplying investments. This may be a real danger in our current and prospective situation.

The flow of equity funds is particularly important. If some people will provide equity investment others will find it safe to buy the senior securities of the same businesses.

The problem is partly a matter of the tax system, which cuts sharply into the two main sources of risk-bearing, equity funds—the retained earnings of corporations and the incomes of well-to-do individuals.

The problem is also partly a matter of customary and legal limitations on the investments of institutions—such as insurance companies, pension funds, savings banks, etc.—which hold the funds of safety-seeking individuals. Ways should be sought to widen the range of investment such institutions may make without unduly increasing the risks of their ultimate owners or creditors.

* * *

The basic requirement for economic growth in the United States is that we should value growth highly. We have all the ingredients—a competent population, advanced technology, effective organization and high incomes that permit large savings. Economic growth is not free. One can imagine a society that, having the capacity for rapid growth, prefers to give up growth for the sake of security, equality or current consumption. This is not the American society. Although we clearly and properly place weight on other objectives that require the sacrifice of *maximum* growth, these conflicts are not so serious as to prevent a very rapid rate of growth. As long as this is true, we have every reason for confidence in future growth.

THE STRATEGY FOR ECONOMIC GROWTH AND STABILITY

Chairman-Moderator: C. C. Davis, San Marino, California
Rapporteurs: C. P. Wilson, Kansas State College
R. E. Seltzer, University of Arizona

PANEL DISCUSSION: "STRATEGY FROM THE STANDPOINT OF AGRICULTURE"

Panel Members: J. A. Baker, National Farmers Union
Marion Clawson, Resources for the Future, Inc.
K. A. Fox, Iowa State College
L. C. Halvorson, The National Grange
O. V. Wells, Agricultural Marketing Service
W. E. Hamilton, American Farm Bureau Federation

Chester Davis: Ladies and gentlemen, President Brandt tells me that today's panel is something of a trial run—an attempt to bring out many points of view spontaneously and without time-consuming formal papers. The panel's task is to present agriculture's special problems and strategy to meet them against the background of general economic growth and stability.

One obvious tie-in was brought out yesterday. Ted Schultz referred to the widely-held view that when the U. S. economy hit its stride under peace-time conditions, commercial agriculture would do quite well. He raised the question, "Why hasn't it?"

I am sure that the same question was burned into the mind of one of the members of this panel a year or so ago when Oris Wells was invited by Stuart Russell to address the National Farm Institute in a letter that ran something like this: "The way things have been going lately, I wondered whether all the things the economists have been telling me all these years are true. . . . I have always believed what some of your folks told me that agriculture needed especially a prosperous and expanding national economy, a high level of industrial production and full employment. We have all these things and agriculture seems to be a comparatively weak link in the economic chain. Now, just what does all this mean?" (laughter) Of course, this is only one facet of a many-sided relationship.

Before calling on Oris to lead off for the panel, let me take a moment for the probably unnecessary identification of the panel members in the order in which they will speak.

Oris Wells is Administrator of the Agricultural Marketing Service in the Department of Agriculture. We have on the panel three representatives

of the major farm organizations. I suggest we call on them in the order of their appearance on the national scene. That means then that the second speaker will be Dr. Lloyd C. Halvorson, economist for the National Grange from Washington, D.C.; then Mr. John A. Baker, who is coordinator of legislative services for the National Farmers Union from Washington, D.C.; then Mr. W. E. Hamilton, who is Director of Research of the American Farm Bureau Federation; then we turn to Dr. Karl A. Fox, Head of the Department of Economics and Sociology at Iowa State College; and, finally, Dr. Marion Clawson, who is Director of the Land Use and Management Program of Resources for the Future Incorporated, headquarters Washington. Now, Oris Wells.

Oris Wells: Mr. Chairman, we now have before us two papers that to me represent a well-integrated, well-rounded argument, even though I am quite sure they were separately written. Fabricant has told us something about economic growth in the United States and has at least suggested the rate that we have been able to maintain in the past. Herbert Stein has very ably advanced the argument of using monetary and fiscal policy as tools for maintaining general stability and has suggested that in addition, in the interest of economic growth, we place reliance upon education and research and upon the maintenance of a flow of savings, of incentives for risk or venture capital and of mobility of resources. I would like now to restate two propositions I first advanced in 1949 at Laramie. First, the general price level concept in peacetime is certainly as misleading as it is useful and rather than to center our attention on the general price level as we were talking at the time, we would do far better to consider a whole series of partial price levels, the differences between them, and finally the general level of employment. Second, as important as full or maximum employment policy is for agriculture, there are nevertheless special circumstances that make it necessary for us to set out certain special measures, which the chairman this morning called "special strategies" for agriculture. I would suggest that there are three kinds of special strategies that are necessary if we are to be reasonably well satisfied with the place of agriculture in the national economy for the decade ahead. One of those special strategies has to do with the price and marketing problems of commercial farmers, the series of problems that are much aggravated by the very successful application of education and research Stein has correctly indicated are basic to economic growth. The second series of strategies for agriculture are those Dr. Schultz so ably talked about yesterday, and center around low income farmers, underemployed people who certainly should have higher incomes, and many of whom will certainly have to transfer out of agriculture to obtain such higher incomes; and the third series of strategies, which I think are especially important as guarantees

of long-term growth, have to do with the conservation of agricultural resources—fact is, I am prepared to argue that all soil mining has not yet vanished from the United States, nor even from California. Thank you.

Chester Davis: Thank you, Oris. No, Dr. Halvorson.

Lloyd Halvorson: Mr. Davis, ladies and gentlemen, first of all I want to say a word about the important role that farm organizations have played in agricultural progress and stability in the past. I feel that farm organizations, have really been the designers, installers, and generators of progress and stability. I feel that progress in the future will depend to a large degree upon the extent to which you gentlemen here develop a close working relationship with the farm organizations and agricultural leaders at the state and national level. About a year ago a number of the farm organizations got together in Washington to plan a strategy for research in agriculture. We have developed a five-year program that I think might be of interest to you. This program calls for a 60-million dollar increase in federal research in the next five years, 120-million dollars in the state experiment stations, a 60-million dollar increase in appropriations for extension. In addition, for the next five years, we are about to agree that we will need 75 million dollars for USDA buildings to house research and 125 million dollars in the state experiment stations. To carry this program out will require, again I want to stress, close cooperation between the professional agricultural workers and the farm leaders. Turning specifically to Herb Stein's paper, let me say that there is very little with which I would disagree unless it is the implication that the only appropriate measures for stability are those that are indirect and general. I feel it is very clear that in agriculture we need to have measures that are very specific and direct; for these reasons—farmers have no control over supply as is exercised by many segments of our economy, we have a fluctuation in supply due to weather and natural factors, we have great imperfect knowledge, and that is important in the case of many entrepreneurs. On top of that we have an inelastic demand curve that can become erratic, and we have oligopoly in industries with which agriculture deals. I feel that unless something is done to meet these problems, we will have a great deal of instability in agriculture in spite of stability in the general price level.

In addition, we need extra stability measures in case of depression. Agriculture is hit the hardest in periods of depression even though it provides society with full output of food and fibers. I think that in the future we want to strengthen and extend these programs, marketing agreements, and so on. I think one thing we have to be careful about is to use them for stability and not for monopoly.

Now, turning to the second main question, the chronic disparity in agriculture, I feel that here is another area where we need the concept of parity. I know that that idea is an anathema to many people, but if we look at it right, we as economists should recognize that we need some kind of a measure of the inquality in marginal returns due to improper allocation of human resources in agriculture. I feel that one of the basic ways to bring about proper allocation of resources is through the kind of program Dr. Schultz got into yesterday, that is helping the people who are no longer needed in agriculture find jobs in other segments of the economy through various programs.

Chester Davis: Thank you, Dr. Halvorson. Now, John Baker.

John Baker: Mr. Chairman, first let me say that I agree fully with everything that Lloyd and Oris have just said. In my everyday life, I am engaged almost full time in either planning or carrying out strategy of one kind or another, so I feel right at home in this subject. Our interest in strategy is for farm families as distinct from strategy for agriculture. There are a lot of spokesmen for the other segments of agriculture; the farm families are the people we are primarily interested in. I would suggest that there are several types of strategy: economic strategy alone, political strategy, and institutional organizational strategy. The strategy we are talking about is strategy farmers can use in their own behalf, not strategy others can use to figure out how to do what to or with folks. What farmers want is higher family income. They need the necessary credit, and they desperately want more nearly adequate community and general welfare facilities. My diagnosis of both the low income farm problem and the commercial farm problem is that the most critical factor is the chronic and continuously weak bargaining position of farm families in the money and commodity markets of the nation and the world. I think that, as Lloyd Halvorson said so well, the goal, and in our minds the main goal, is parity of farm income and living standards, as stated in the 1948 farm act. A hundred percent of price parity is just an intermediate step in that direction.

Listed briefly these are steps in this strategy: private individual and associated action to acquire greater market bargaining power; expansion and federation of existing supply, marketing, and service cooperatives; and the buying in by farmers into basic industries, manufacturing, marketing, and processing businesses. I think that if the existing farm organizations do not immediately start providing representation to farmers in the bargaining process, that they will develop ways and means of providing that service for themselves through other organizations, under or in the absence of additional federal and state marketing agreements and orders.

Another point in strategy, I think I see coming on the part of farmers, is a vast expansion of farmer-protective state legislation of the type that Mr. Coke described yesterday as already existing here in California. As somebody said, the raisin and grape growers have "done got it made." In federal legislation, to mention just a few needs; improvement in old-age and survivors insurance under social security so the farmers, like anyone else, will have better security when they reach retirement age; in the future expand or extend minimum wage legislation to cover farm labor and raise the level of minimum wages; and expansion of the Farmers Home Administration to where it provides a complete and comprehensive yardstick farm credit program. In addition, I would list specific action programs to expand foreign and domestic demand, and specific action programs and permissive legislation to encourage, assist and allow farmers by joint action to help keep market supplies at a reasonable balance with augmented demand, and expansion of crop insurance.

Chester Davis: Thank you, Mr. Baker. Now, Gene Hamilton.

Gene Hamilton: Thank you. Mr. Davis. The Farm Bureau, like the National Farmers Union, believes that the important thing in agriculture is high per family real income. We would not agree with all of John Baker's points on how you achieve that goal of high per family net income. We would place a great deal of stress on the monetary and fiscal factors Mr. Stein outlined so well. In fact, we would agree with a great many of the things he said, and I would stress, from the standpoint of agriculture, one or two additional points. One, which Lloyd Halvorson mentioned, is that agriculture suffers severely in a depression. It is desirable, from the standpoint of agriculture, to have a relatively stable price level because I have a feeling that avoiding the excesses of inflation is a good first step toward avoiding the disaster of deflation. There are other reasons why inflation should be avoided. For example, it is an inequitable form of taxation, and now in the present circumstances when we have surpluses in agriculture, and a relatively tight situation with regard to use of some other resources, it is obvious that we need to avoid inflation because inflation would tend to raise farm costs more than farm prices. I would agree with Mr. Wells that we need some special strategies from the standpoint of agriculture. I probably would disagree to a considerable extent upon the nature of these strategies and the emphasis that should be placed on them.

One of the things we stress in Farm Bureau is that agricultural programs should be directed toward solving farm problems and removing the things that cause agriculture to be at a disadvantage, rather than toward perpetuating the problems and making it convenient and comfortable to live with them. From this standpoint we regard price supports

as a means of cushioning adjustments that have to be made, and not as a means of giving farmers a desirable level of income. It is very difficult for me to see, in any long-range view, how we are going to have a satisfactory average level of income in agriculture unless we follow the ideas Dr. Schultz advanced of encouraging the movement of excess people out of agriculture. As a matter of fact, that has taken place at a very rapid rate since about 1940. There was a little evidence, on one or two occasions, of farm population turning up when business was turning down, and that very much highlights the importance of maintaining relatively full employment in the rest of the economy so that there is increased opportunity for farm people to move into nonfarm jobs.

We stress especially the things that open up opportunities to people in agriculture, both for those who want to stay in agriculture and for those who are willing to leave. There is resistance in some quarters to the idea that we ought to have people moving from agriculture to nonagricultural work. This may involve some pain to the individual, and an individual may feel that somebody should do something so that he doesn't have to move. Some people put it this way, that it means squeezing people out of agriculture. We, in the Farm Bureau, suggest that it be approached in terms of increasing opportunities, both for those who wish to stay and for those who wish to do something else. The politicians are not quite sure that this is a good idea from their standpoint. To a congressman in a rural area it might mean redistricting his area and that might not be good from his standpoint, and he's a little afraid of the reaction of his constituents to the idea that maybe some of them might be better off somewhere else. I think that labor is a little bit fearful of this idea that some people should move into nonfarm work because they may not want increased competition for nonfarm jobs. Then there are those tender-hearted, well-intentioned folks who stress the benefits of rural life; we ought to keep the farmers out on the farms because they are good people and the country air is fine for folks. True, there are many advantages to living in the country provided you have income, but in the present day and age poverty isn't any prettier in the country than it is in the city, and we come back to this question of opportunity.

I'm glad John Baker mentioned international trade as a very important factor in agriculture. Lloyd has mentioned oligopoly and has referred to some other segments of industry that have more control over their prices than we have in agriculture. But I want to stress two points; one point is that, from the standpoint of agriculture, an important strategy is preventing the things that place agriculture at a disadvantage, for example, preventing the strangling of international trade, and preventing the exercise of monopoly powers. Another point that I want to stress is that, assuming

that there is some oligopoly, the real question is whether or not agriculture can gain by copying some of the practices of others. In other words, the question is: what is good for agriculture, not whether we should do something in agriculture because it is being done somewhere else. Now, I would like to make some remarks on research, but I believe that my time is up.

Chester Davis: We are going to have plenty of chances to get at these points, and we hope there will be some discussion. Now, Karl Fox.

Karl Fox: I find that I am holding an orthodox point of view on a panel where there is a good deal of convergence. I have three points to make. One is to affirm my own faith in the basic policy, or strategy—faith in the long-run effectiveness of sustained high employment, in bringing about comparable returns to labor in farming and other sectors of the economy. I think our policies should be directed toward moderating the fluctuations and deviations around this path toward some sort of satisfactory high employment equilibrium. I think that is evident from what Gene Hamilton has mentioned, when he indicated that over the last fifteen years high employment has operated to reduce differences, to expedite migration from low income areas, and to reduce differences in incomes.

I'd also like to comment on the effects of agricultural policy on stability and growth of the rest of the economy. I can't say much about that—whether price supports, of course, do act as a built-in stabilizer to resist or offset part of year-to-year change in employment and income in the rest of the economy. However, when agriculture has only 10 percent of the labor force and 5 or 6 percent of the gross national product, these effects are really not large when measured in terms of percentages of gross national product itself. In other words, we cannot get too much support for our farm price support programs, from their effects on the rest of the economy. In particular, differences between price support programs are quite small, almost negligible, in their effect on the rest of the economy. I think they have to be considered in terms of their effect on agriculture itself.

Now, my third point is really a comment on models and measurements in this area of economic policy for stability control. I was somewhat disappointed in the slow progress implied in Fabricant's paper. I think that we should be able to proceed fairly rapidly within five or ten years to a model of the economy which would give us rough estimates of the effect of any particular policy or set of policies upon growth and stability in the economy as a whole and in individual sectors of it. This involves organizing the best descriptive knowledge that has been generated by the

National Bureau and by the Bureau of Agricultural Economics and other organizations, but also welding it into significant structures, structures that make sense in economic theory, and I think in this report men like Lawrence Klein or Tinbergen have a good deal to contribute. I have a little impatience with the helpessness, or having to fall back on intuition, on all points on the questions of the effects of economic policies upon economic growth.

Chester Davis: Thank you, Karl. Now, the final of the direct statements, Dr. Marion Clawson.

Marion Clawson: Instead of repeating or describing the many statements of previous speakers with which I find myself in agreement, I am going to simply state some aspects of a strategy for agriculture as I see it, and I am proceeding on the assumption, or the hope, that there will be achieved a very substantial measure of general economic stability, and at a fairly high level of general growth rate. Then the question comes, what is a special strategy for agriculture? My conviction is that advancing technology in agriculture—and I would interpret that term very broadly—is going to lead to a fairly substantial increase in output on a continuing basis. I wouldn't say that there won't be fluctuations, but I think we are going to see a continuous increase in output for a substantial period of time, more or less indefinitely into the future.

The economics of the individual farm will lead to rapid adoption of technology under conditions where if agriculture were monopolistic it would not be in the industry's interest to adopt such technology. The effects of most of these technologies will be upon increasing output rather than upon cost saving with given output. As a result I am quite well convinced that we are going to see agricultural output expanding at least as fast as demand for the same commodities for several decades ahead. In other words, the farm surplus problem is not a temporary one but a chronic one. The acuteness of it may vary, but the problem itself may be continuous. Now, if that is the correct diagnosis, or based upon that diagnosis whether it is correct or not, the basic over-all strategy, for agriculture and for the nation, is to consider just how much resources, human and natural, we want to put into agricultural production. What is the proper level of inputs into agriculture, in order to have certain orderliness to the production and consumption side of agriculture? In that connection, it seems to me that for the past twenty-five years, agricultural economists, agriculture and national policies have been obsessed with adjustments in land. Moreover, most of these adjustments have failed to accomplish any real adjustment in agricultural output, and I would argue that the acreage reserve plan will not decrease output in the short run and will increase it

over periods as short as three to five years ahead. The conservation reserve will have more effect in reducing output or stabilizing output over a little longer period, but I think its effects, too, are as likely to lead in the direction of increasing as of decreasing output. Agricultural programs need to be reoriented to deal with all of the inputs in agriculture, but particularly the one of human resources and labor. And there I find myself in agreement, to a considerable extent, with Dr. Schultz's paper yesterday morning. To the extent that the acreage control programs of the past have had any effect on the supply of labor, it has been to drive people out of agriculture through making it unattractive. It is often said that people move in response to a push or a pull, but historically in this country the pull has always been infinitely more attractive than the push, and I think if we could, we should direct programs to adjust the supply of labor in agriculture and to be helpful to the people so concerned. Such programs, as was pointed out by one of the previous speakers, are often interpreted as inimical to the interests of farm people. I think quite the contrary can be true, and I would like to add just one last point of that nature. I think our concern is not only the adjustment of the total supply of labor, but in the kind of an agricultural community we have left. I have used the analogy of a forest of mixed species. Nature takes care of the limiting and pruning of the trees, but may come out with a much less productive forest than if you had stepped in to do some pruning and thinning yourself. Migration is a selective process, not only as to age but as to other characteristics, and if we are going to have sound agricultural communities, it seems to me that we are going to have to do something to build in that direction and not leave this entirely to chance movement of people in response to economic opportunity.

Chester Davis: Well, we didn't do quite as well on timing as we expected we would, but then I didn't expect that we would. (laughter) I want to congratulate the panel on their ability to compress a universe here into five minute talks, and I also want to congratulate our distinguished man on my left, Oris Wells, for he gets the medal for brevity. He talked just three minutes. Now, then, let's get at the questions, Mr. Halvorson.

Lloyd Halvorson: During this past year in Washington we saw quite a fight between proponents of high supports and low supports, both within the farm organization group and within the Congress. I would like to ask a nonagricultural economist, and that's Herb Stein, whether or not he feels that price and income disparities are sufficient incentives to adjust our resources in this country to the differential effects of progress without undue hardship upon those segments of the economy most affected by progress?

Herbert Stein: The question is difficult to answer unless one says how much, that is how much price and income disparity. The existence of some price and income disparity is a necessary condition for the kind of movement and adjustment that produces efficiency in the economy. It is also quite conceivable that income disparity would exceed the degree that is useful for producing such adjustments and might even reach a degree that impedes such adjustments. The problem there would not be the degree of disparity but the absolutely low level of incomes earned by some groups that ought to be moving or making adjustments. The level might be so low as to impede rather than to facilitate the adjustment.

Lloyd Halvorson: I would say yes, but I would also like to find out if the CED has done any thinking about what might be done to facilitate this mobility which is so important in bringing about adjustments of the economy to the differential effects of progress without undue disparities.

Herbert Stein: The CED, in a policy statement on agriculture issued last February, made some suggestions in this direction with respect to improving information and the employment service, improvement of educational facilities in the most backward rural areas as a means of facilitating movement, improving credit facilities and so on. We regarded this as mainly a problem of the extremely low-income sectors of agriculture rather than of the commercial sector. The committee's belief and hope was also that some kind of land retirement program might be adopted with features that would tend to facilitate rather than to retard the movemen. With that in mind the committee proposed that a land retirement program be adopted that would emphasize the withdrawal of whole farms from cultivation for considerable periods, with the thought that this would really free the human agent.

Chester Davis: Anybody else want to take a shot at that question? We don't bar the farm economists.

Oris Wells: I have a question, Mr. Chairman. On Halvorson's question I have already said that I think certain special strategies for agriculture are necessary and I could argue all day with these three farm organization men. I have always thought, what an interesting exercise it would be if the American farm organizations and agricultural economists would address themselves to the general problem of what they would do in this price support field if, by some miracle play, one could disbar the appropriation of any direct sums for price supports, for subsidies, commodity price fixing, or foreign currency operations; but I don't think such a non-subsidized program is likely to receive serious consideration, and at this point I would like to turn to Karl Fox.

Karl says he has still a sustaining faith in the powers of full employment over the long run in solving our problems. I don't know, Karl, if this is the kind of an equilibrium answer which says that we are interested chiefly in describing conditions in the economy when it comes to rest. I have never myself been much interested in conditions existing in an economy at rest. I am interested in the problem of transition and I think these are the problems that the economist has to be interested in if their economies are growing, because in growing we run constantly into maladjustments, and the problem is how to keep flexible. Let me further illustrate this problem by saying that I think this problem is a little bit tied in with the kind of literature that Americans read. We always read the story about a boy who spends all of his time getting the girl and then immediately comes to a state of rest and lives happily ever after. Perhaps the chief problem is how to live with your wife. (laughter)

Karl Fox: Oris, I don't think I disagree with you very much on that point, and I have not become wholly etheral and abstract. I am interested in where we are today and in the process of movement. Oris, one of the bits of evidence I had in mind when I said that high employment does help to solve problems is a narrowing of about 40 percent between 1940 and the present time in the dispersion of taxable incomes among different states, a narrowing of, I think, about 45 percent over the last 15 years in the dispersion of farm-operator level-of-living indexes among states, and a very close relationship between the original level of living in different farming areas in the United States and the rate of migration from farms to other occupations and other residences during this 15-year period. I think that it is rather significant that what you might characterize as 40 percent have gone toward some moving equilibrium. High employment equilibrium has been accomplished by pulling people out of agriculture. I think for the most part only in the last year or two of this 15-year period can we say that there has been much of a push.

Oris Wells: Let me say, Mr. Chairman, that I wasn't trying to disagree with Karl. My first point in an agricultural program is full employment, because I think both our short-term and long-term farm problems are unsolvable without substantially full employment and a reasonable rate of economic growth.

Chester Davis: I imagine that the farm organization boys are champing at the bit, and who wants first crack? Gene?

Gene Hamilton: Well, I'd like to come back on the question that Lloyd raised just briefly and make the observation, that if we have price support programs that subsidize inefficiency within agriculture, that makes it more

difficult for the efficient farmer to make a go of it. Now, this takes us back, of course, to Dr. Schultz's analysis of yesterday, and the Farm Bureau would lay more stress than did Dr. Schultz on the effects of price supports in terms of holding people in agriculture, and in terms of drawing resources into agriculture, and thereby helping us to get into this surplus situation which has resulted in lower prices and some difficulty for the commercial farmer.

Chester Davis: John?

John Baker: Mr. Chairman, I mentioned earlier that it seems to me there is additional strategy for farmers than just economic strategy. I think that one thing that the farmers in the United States need to do, and in the not too distant future will do, is to withdraw their membership from all general farm organizaions except one. I don't know which one that will be —that hasn't been determined yet. (laughter) Number two, I think that farmers in building into the business structure of the United States through purchase will want to control their business enterprises through that general farm organization to prevent the growth of what might be called manageritis and commodity by commodity Balkenization. (laughter) Finally, I think it is incumbent on any existing farm organization to lead the farmers case for legislation to all major political factions and parties just as forcefully as they can, and to work through those political parties to bring about the enactment of whatever program their strategy dictates.

I think that in addition, and possibly more important than that which I have already mentioned, Mr. Chairman, is the necessity for farm people, as citizens, to engage in caucases, precinct elections, the financing of candidates and the participation in campaigns, as part of a general strategy for farmers or a general strategy for agriculture. And in doing that, farmers need to establish working strategy relationships with the small business man, with professional people and with organized labor for the progress of mutual aims in the general welfare. And I want to reiterate that one of the main things that farmers have got to do in order to be able to maintain anything like an equality of opportunity and bargaining power is to accumulate somehow or another the funds to buy their way into the business structure of the United States.

Chester Davis: Well, I'll say this, that when the program committee wrote the term "strategy" into the titles of these various talks, it opened wide the way absolutely to political strategy, and I think it makes a very interesting contribution. But this does open the way to a little internal discussion

among the farm organizations, and I think we ought to have a quick response, Who wants it? You Lloyd or Gene?

Lloyd Halvorson: I certainly agree with what John has said as to the importance of political activity on the part of farm people. Another aspect of this political activity in relationship to progress that worries me is that, actually, a lot of this legislation that sometimes gets close to being enacted would be very deadly to progress. I feel therefore, that, it is very important that people understand just exactly the route of progress so that everyone will know, that when someone proposes something that will stand in the way of progress, that then they will be known as blocking progress, and I think that then we will have greater ease in fighting and defeating these legislative efforts that tend to block progress. I feel that this whole matter of progress needs to be brought out to the public so they understand it, and once that is done it will be very much easier for the people to see what proposals are the kind that need to be defeated for their effect on progress.

Chester Davis: Gene?

Gene Hamilton: Well, I can comment very briefly. I would certainly agree that it is important that farmers be active politically, but I would be inclined to go along with what Lloyd said, that one of the big problems is to prevent too much legislation. I don't think that these problems are going to be solved on a political basis, and I think that the evidence thus far is that attempting to solve them on a political basis interferes with the economic situation and tends to aggravate conditions. I don't want to be misunderstood. The Farm Bureau is for quite a bit of legislation, and quite a bit of farm program (laughter) but I am simply trying to make the point that I think we have had too much, and we could have considerably more. Now, with regard to what John Baker said about cooperatives, that's a separate subject in itself. We would not limit self-help to the cooperative field. There are some things of an educational and cooperative nature that don't really involve cooperatives. For example, many of us believe that the development and production of a meat-type hog can do a great deal to help the pork situation. It is a self-help effort, but it is educational, not over in the field of cooperative marketing or supply purchasing. Thank you.

Chester Davis: Gene, I'd like to ask you. Do you and Lloyd agree that the trend now and the prospect is toward one big farm organization in the United States? (laughter)

Gene Hamilton: I would doubt if that trend is evident at the moment, and I'm not sure that it would be a good thing. I'm opposed to monopoly myself. (laughter) These questions are highly controversial and as a representative of the largest farm organization, I am prepared to say that those who disagree with us are entitled to have their own organization. (laughter)

Lloyd Halvorson: Mr. Chairman, I feel that possibly the trend might be a little in the other direction. The Grange came into existence after the Civil War, the Farmers Union after the War with Spain, the Farm Bureau after World War I, and now we have another farm organization on the horizon, the National Farm Organization. I feel that there might be some shifts in membership. However, there are a lot of things in agricultural progress besides just matters of income. We feel that the improvement of the home and community environment is possibly one of the greatest needs in the way of really making progress in living for a farm people.

Chester Davis: I think its about time that we give Herbert Stein a chance for a recapitulation.

Herbert Stein: I think there's only one point on which I ought to comment at this time. This is a point that was raised explicitly by Mr. Wells and Mr. Halvorson and by implication in what almost everyone else had to say, and that is the question about the degree of reliance upon general measures, to the exclusion of measures to deal with specific industries in specific situations. I didn't mean to imply in my talk, exclusive reliance upon general measures. I recognize the existence of certain industries that are declining, that are subject to extremely large fluctuations in which participants earn extremely low incomes. I would recognize the existence of a national concern with such situations. Yet, I would look at such situations with a great deal of suspicion. The situations deserve correction, but there is so much danger in the measures advanced to correct those situations, will not in fact correct them, and will in fact impete the growth of the economy and reduce its efficiency. When we deal with particular industries, it is so difficult, even on the most objective basis, to distinguish between those income disparities or divergent trends of output and prices that are useful in promoting efficient economic adjustments and those that are from that standpoint unnecessary or undesirable—especially when the problem of dealing with those situations is thrown into the political environment in which it must operate—that the likelihood is remote of reaching solutions that will in fact cure the disease without causing cumulative damage to the economy as a whole.

I would not reject specific measures a priori, and probably we should

have and will have a farm program. I would be most interested in seeing the development of programs that both in political and in economic terms seem likely to solve the problems that everybody recognizes, without creating additional problems and burdens for the whole economy. I am especially impressed with this danger and perturbed about it when I hear the political strategy discussed here. I think that probably my whole concern can be summed up by saying that the political strategy seems to have been developed so much more fully and effectively than the economic strategy that I am very uncertain about where we come out when we go down this path.

Chester Davis: Thank you, Herbert Stein. Before we go to the floor I wonder if there should be some comment from the panel on what Mr. Stein has just said. I though there were some points there that might provoke some discussion.

Oris Wells: Well, yes sir, Mr. Chairman. There are two comments I'd like to make on what Mr. Stein has just said, not necessarily disagreeing with him, but rather supplementing and modifying what he has said. First, American agriculture is not a declining industry. Measured production-wise we are a growing industry and this is also true in terms of the demands created by a growing economy. It is perfectly safe forecast that we are going to want larger supplies of food and fiber in the future. Science is practically littered with hypotheses that various people have from time to time evolved, where they have forgotten factors that are constant or supplies that are in fact free. And, I certainly hope we never run into the situation where we have a scarcity of agricultural products that would impede economic growth. Second, in case anyone here this morning has thought that the discussion deprecates the American system of government, I want to say that I have watched the American Congress and the executive branch and those people who work with me for some twenty-five to thirty years, and I frankly have yet to observe around the world a system of political action as effective as that which we have here—it works very well indeed.

Chester Davis: Thank you, Mr. Wells. Now we will go to the floor.

Leonard Miller (Oklahoma A & M College): Marion Clawson stated that he didn't believe the acreage reserve would be very effective in reducing total supplies. I agree if this land is to go in one year at a time, but would ask for other reasons for Clawson's statement.

Marion Clawson: That is the chief reason, but I think that putting land

into an acreage reserve leads to more intensive use of land not in the acreage reserve. It seems to me that is the experience of the last twenty-five years. I'll admit that it is virtually impossible to say what would have taken place if we had not had various types of acreage manipulations. That is to say, we have used a great deal more fertilizer, we probably would have used a great deal more fertilizer in any case, but it is my conviction that taking some land out of production, particularly if it is not whole farms, leads to more intensive use of what is left. I didn't mean —and maybe it wasn't your implication—that I am necessarily opposed to an acreage reserve program. But I think one should recognize what it cannot do, and I don't think it should be the whole of our agricultural program, or as large a part as I think it is.

Chester Davis: The next question?

Avery Bice (Colorado A & M College): The proposals of yesterday and today were to move people out of agriculture. I would like to ask the panel members what would happen if that were to occur, from the standpoint of leaving resources for those more able farmers who would perhaps remain in agriculture—in terms of possible stimulation of overproduction.

Chester Davis: Thank you. I'm going to pass that one to Karl Fox. (laughter)

Karl Fox: I'm going to pass it to somebody else. (laughter)

Gene Hamilton: I don't think we need necessarily to assume that it would be entirely the less efficient who would move out of agriculture. I think one of the keys is better education and opportunity and letting the individuals themselves decide whether or not they are going to move out. Suppose that the assumption is right and it is the less efficient who move out, and that the resources they release are more efficiently utilized. Then you do get more production per man from those who are left. But those who are left do not need quite as high a margin to maintain their net incomes, and I think this question of surpluses comes back to price policy. Marion Clawson spoke of surpluses as being chronic. Well, it is easy to make the case on the basis of present trends, and present policies, that they are chronic. I think that present governmental policies, including price supports, tend to aggravate the surplus problem. Even the soil bank, which certainly is going to put more capital into agriculture, could have that effect—particularly in the long run. So whether or not they are chronic, is partly a question of policy.

Lloyd Halvorson: I would like to make a comment on that also. I feel that movement of people out of agriculture might even reduce the total agri-

cultural production, because there are marginal areas that are now possibly farmed intensively, and would not be so farmed with movement of people out of agriculture. But more basically my point is this, that even if we did increase the production of agriculture by moving people out, that the total agricultural income would be distributed among fewer people and per capita farm income would still be higher. That is what counts and would possibly provide the consumers with cheaper food at the same time providing adequate incomes in agriculture.

Chester Davis: The next question?

Bob Eggert (Ford Motor Company): I would like to ask a basic question here as to whether or not the goals are right. In all the discussion here I have heard no reference to percent return on investment, which seems to me could be a major goal for farmers for comparing their income against the income of others who invest and have businesses like farming. It seems to me that goals like price or even parity are very elusive here and we get into all these problems of cost adjustment. This net return on investment has some problems, too, but I'd like to raise that as a question. And I also am surprised that more attention hasn't been given to the point that Marion Clawson raised, that the basic problem here is a very rapidly expanding technology in agriculture against an inelastic demand. In the automobile business we give a great deal of attention to what the customer wants. Can you devote more, for example, of your resources in agriculture to the production of the kinds of things that the customer is willing and able to pay for? If resources can be directed towards the production of the kinds of things people want, increasing their supplies, rather than the other type, then such a policy would be rather successful. Also, I want to ask if research shouldn't be developed more along the line of labor-saving aspects rather than yield-increasing aspects. (laughter)

Chester Davis: Mr. Eggert, would you identify the member of the panel whom you would like to take your first question, please?

Bob Eggert: O. V. Wells.

Chester Davis: That was a triple-barrelled question. The first one—let's take it first, Oris.

Oris Wells: I think American farmers would be very happy to settle, Mr. Eggert, for the same average percentage return on their investment, after allowing for salaries and wages of management and labor, as is ordinarily enjoyed by American industry.

Lloyd Halvorson: I would like to comment on that, because I mentioned the need for a new kind of parity. To me it would be possibly the marginal rate of return enjoyed by human resources and other resources in agriculture. The Grange is definitely thinking along these lines, and we are going to work on a parity formula along those lines. I might briefly say that industry, after taxes, earned about ten percent on its equity last year. I am afraid that our parity formula on this basis would be very high; but after making certain adjustments for the lower cost of living in agriculture, and a few other things, we could still approach a parity formula in that direction that would be very accurate. Those based on the historical past, I don't think are very good.

Chester Davis: Would it be fair to ask Sherman Johnson if he would want to take this question of saving labor without increasing output?

Sherman Johnson: I can comment very briefly on it. We have been trying to do just that. The problem of increasing labor savings without increasing output is a very difficult task. Most of the cost-reducing improvements also have a tendency to increase output. I agree with Mr. Eggert that we should do all that we can along those lines. And I am personally in favor of reducing all of the stoop labor that we possibly can, regardless of its effect on output, because I do not think that any farm people are going to get rich doing stoop labor. I am a little disappointed this morning in our strategy for agriculture that we haven't talked about all farm people, including the hired workers, including migrants, if you please. I think we ought to think about all farm people, in our strategy for agriculture, and I think that we ought to concentrate our attention on a strategy that will pull them out rather than push them out.

Chester Davis: Thank you very much, Sherman Johnson. Now, on the second phase of Mr. Eggert's question, I would like to know if anyone would like to comment on this question: Do the rigidities in our parity formula and the price support legislation keyed to that, tend to prevent this shift of resources in the direction of customer requirements?

Gene Hamilton: I think that there are rigidities, definitely, that affect the allocation of resources both within agriculture and between agriculture and the rest of the economy. Certainly I think price supports have been an offender in this respect. I did, just very briefly, make some reference to the need to find out what the consumers want by citing the example of the meat-type hog. I think it is very important to find out what the consumer wants, and to try to give the consumer what he wants, and that there are some opportunities in agriculture for differentiating products. One of the problems we have, of course, is that so many agricultural products are

primary products sold on a bulk basis, but to the extent that individuals or groups can develop distinctive products, they become less vulnerable to price fluctuation.

Chester Davis: Now, Mr. Eggert, we didn't resolve all the angles of your question, but at least we have given them a nod. The next question?

Grace McDonald (California Farm Research and Legislative Committee): I would like to ask Mr. Baker why the low-income consuming public was not brought into this discussion, and what effect it would have if the 30 million people in families of less than $3,000 income per year could be brought into full use of agricultural products?

Chester Davis: Mr. Baker, that's yours.

John Baker: Operating under the limitation of debate of the house, I specifically mentioned what the lady has asked about in these words: "specific action programs to expand foreign and domestic demand." In expanding domestic demand, we feel that there are three specific action programs that are very valuable in this area. One of them is the special milk program Congress again expanded last year. It is still too small. The school lunch program—although it was expanded last year—still reaches less than two-fifths of the schools in the United States. It should be expanded until it reaches all of them that need it and want it. And, it is now more than three years ago that Senator Aiken first introduced the national food allotment stamp plan, that has been opposed by the executive branch of both varieties. It has now, however, in the Senate, achieved the support of some 37 to 39 Senators. The most recently enacted farm act requires the Department of Agriculture to make a specific report to Congress before the first of this coming January, stating and making their recommendations how they would carry out a food stamp plan to provide purchasing power to the 30 million people whom you mentioned. That very definitely is a part, in our opinion, of the strategy that is necessary. Now, there's one more thing that needs to be said. Once the 30 million people get the extra 2 billion dollars of purchasing power that would be involved, then all we have done is to have pushed the demand curve up to that extent. If we trust that nine million farmers desire to produce and produce and produce continuously, we get no added lift to demand from the food allotment stamp plan, after that initial increment. So, it is all a part of the problem, and it helps a lot of low-income folks get adequate food and clothing if we include fibers. But it is not something that is going to help you in 1960. It helps you in the year in which you adopt it, and then it is just part of the going concern and then you have to keep right on being concerned.

Chester Davis: Well, if the moderator may be permitted to express an opinion, I should personally like to see the food stamp plan, school lunches and so forth charged against the general welfare objectives in the United States, and not charged against the agricultural program. Now, is there another question? Yes, Ted Schultz.

Theodore Schultz (University of Chicago): Mr. Chairman, the main speaker did a service in citing rather carefully how fiscal and monetary measures were brought into play in 1948 and 1949, and 1953 and 1954, with considerable cross currents in Congress. Would you say a word or two, Herbert, about the cross currents at the executive level, in the first two quarters of this year, and especially about the conflict of diagnosis as revealed by the position of the Council of Economic Advisers and the Treasury as against the Federal Reserve Board?

Herbert Stein: Well, I don't have any inside information about what went on among the Federal Reserve, the Treasury, and the Council of Economic Advisers this spring over the question of monetary tightening. I think it is general knowledge that the Council and the Treasury did not feel that the time was appropriate just then for a tightening of discount rates which the Federal Reserve System had put into effect. It seems to me that this was an occasion in which there could be a legitimate difference of opinion in diagnosing the economic situation, and that one could at that time have legitimate doubts about the wisdom of tightening in circumstances in which several industries, notably the automobile industry, were undergoing a recession. So I think it is hard at this point to say that the action was too rigid or premature. The question Ted asked was, what light this throws on the desirability of integrating monetary policy into the executive branch of the government more closely than it is now integrated through the semi-independent Federal Reserve System. It seems to me that while a good general case can be made for the integration of monetary policy into the executive branch through the Council of Economic Advisers or some other agency, this particular illustration may point to one of the hazards of doing this. That is, if it turns out to be correct that monetary tightening was needed to restrain inflation, here we have a situation in which the more political offices, that is the offices of the executive branch, who don't enjoy as independent status as does the Federal Reserve, were arguing against tightening. One would expect that to be the natural bias of political officers, especially in an election year. If one could see people presumably as devoted to sound money as the present Treasury and Council of Economic Advisers still being nervous as they were in the spring of this year, about what was after all a rather moderate move at a time when the economy was at a high level, that, it

seems to me, would reinforce doubts about the wisdom of putting the whole authority into the hands of political officers.

Chester Davis: I have observed this operation fairly closely myself, in the last decade or so, and one conclusion I've reached is that not only within government, but also outside of government, there are lots of people who would like to eat their cake and have it too.

Chester Davis: The next question?

Bruce Johnson (Stanford University): I would like some comments on the policy implications of Dr. Halvorson's reference to the contrast between the presence of oligopoly in industry and the competitive structure in agriculture.

Lloyd Halvorson: I feel that the policy implication is that we need marketing agreements, we need strong farm cooperatives, and we possibly need price support programs in order to offset that. Now, it is a well known fact that if the demand falls off a little bit at the consumer level, practically all of that is passed back to the farmer, and I don't think that is a healthy thing. I hope all economists agree that such kinds of influences on agriculture can destroy even the efficient farmer, and make agriculture so unstable that we can't have the efficiencies and specialization in scale.

Chester Davis: I think that there are signs either that we have exhausted the subject or audience, I don't know which it is. So, I think possibly one more question, and then we should return to the panel. Dr. Taylor?

Henry C. Taylor: We have recently had an example in the public economic life of this nation that impinges upon the farmer's interests. When the steel strike was on, the government stood on the sidelines and did nothing in the interests of the consumer. On the other hand we had an increase in wages in the steel industry which was followed promptly by an increase in the price of steel. This was followed at once by a five percent increase in the price of farm machinery that the farmers buy. So long as artificial methods are used, with the force of strike behind them, to unbalance the ratio of agricultural incomes and incomes of other occupations, will it not be necessary to have some kind of artificial activity to support farm prices in order to maintain the balance? Another question bothering me is whether or not there may be some means of making a direct attack upon the artificial means of raising the prices of things that farmers buy. I am sure that the panel has worked that problem out and has the answer. (laughter)

Chester Davis: While I am in greatest sympathy with the point of view you have expressed, Dr. Taylor, I must confess that the panel has not as a body, exhausted the question. Do you want to direct your question specifically to any member of the panel?

Henry Taylor: I wouldn't know which one.

Chester Davis: That's the fix I'm in. (laughter) I'll say let's try Gene Hamilton.

Gene Hamilton: All right, I'll try. In the first place, I would doubt that there is quite as much exercise of monopoly power in industry as has been implied by some of the comments that have been made here. There is, particularly in the long run, competition among materials and there are various forms of competition. Now, certainly from the standpoint of agriculture we want to intensify this competition. If there are places where it can be proved that there is monopoly power being exercised, we want to enforce the anti-trust laws, and in some cases we may want to strengthen them. This question of the steel settlement is a somewhat different issue. It involves the question of big industry and big labor getting together on a settlement. I certainly do not feel that the government should have intervened in the steel strike. Dr. Taylor raised the point that they did not intervene on behalf of the consumers. Even if I were sure they would have intervened on the behalf of the consumers, I would have been opposed to it, because while we might agree that that was a good idea, the precedent of government intervention could lead to later intervention on behalf of the producers or on behalf of labor.

We in Farm Bureau have been concerned with what we call industry-wide bargaining, where the steel union, for example, can shut down the entire steel industry, and that becomes a strike against the public. If the steel unions were to shut down a single company, the public, as long as it were able to get steel from, say, half or two-thirds of the total production capacity, would be able to withstand a strike for a very long period. But the public can not stand a complete shut-down of the steel industry for very long. What it seems to me they did in this case was that they struck long enough to begin to create some shortages some places in the economy to make up for the fact that the steel industry had been producing in excess of the current consumption rate for several months. By getting a number of people rather short of steel they softened up the buyers for a higher price of steel and for a higher wage settlement. Now, the thing that really concerns me in this is the apparent evidence that big industry and the labor in big industry are in a position to have considerable to say about the division of the gains of increased productivity, and the possi-

bility that such a settlement can be inflationary. And that concerns me because agriculture is a competitive industry, and I think yesterday some reference was made to the fact that agriculture, despite price supports, tends to pass on the benefit of increased productivity to the consumer. Well, if agriculture passes its gains from increased productivity on to consumers in terms of lower prices, and labor and industry are able to pretty largely split up the gains of increased productivity without passing any part of them on in lower prices then it seems that agriculture is at a disadvantage, and there is increased pressure for people to move out of agriculture and thereby to redress this balance.

Chester Davis: Well, now, and I say this regretfully, that the panel has got the ball, we are going to keep it just a few minutes because we have to finish. I think that point you raised, Dr. Taylor, certainly illustrates that there are causes that contribute to inflation which are extremely difficult to reach by monetary action alone. I expect John Baker wants to comment on that last question, and there are some others, so we'll run over panel and then wind up this session.

John Baker: Well, I'm sure that I don't have any additional comments to make in terms of subject matter, except to say that I appreciate deeply the opportunity to participate in this panel.

Chester Davis: Gene, do you have anything more now?

Gene Hamilton: No, nothing now beyond saying that I have enjoyed having the opportunity to appear before this group.

Chester Davis: Oris Wells?

Oris Wells: Well, Mr. Chairman, I had the privilege of having Stein's paper in time to read it and study it at some length, and I want to say that I found it a very informative paper, and I want to recommend to the audience that it is well worth their reading and studying at their leisure. Finally, I want to say that the economic problem of my lifetime has centered around stability and trying to generate an expanding economy, and I think Karl Brandt is to be congratulated on the sessions that have led up to and included this panel discussion.

Chester Davis: Dr. Halvorson?

Lloyd Halvorson: My final word is that I hope that we as scientists in the field of agricultural economics will spend probably more time in the

future than we have in the past on the problems, not only of speeding up progress, but also of developing policies to accommodate progress, so that the effects are not so severe that people might even resist it.

Chester Davis: Karl Fox?

Karl Fox: I have only a footnote on the matter of the steel settlement. Of course, I don't know what is happening to the prices of automobiles, household appliances and so on in the wake of this, but it seems to me that there is a tremendous amount of price competition at the retail level. I would like to know more about it. I do have some faith in it as an antidote for this apparent one, two, three, wage increase, price increase sentiment that you see at the edge of the steel industry and the steel union level.

Chester Davis: Marion Clawson?

Marion Clawson: I would just like to say that I, too, have enjoyed being here, and like all good economists, I have to put in some qualifications. I don't think any of us thought, or meant to imply, that we had covered everything that might have been said. Certainly such points as the role of hired labor in agriculture and a number of other things would have certainly been included if we had a longer time and were attempting to present what we thought of as a complete picture.

Chester Davis: Herbert Stein?

Herbert Stein: I want to say again how pleased I am at the opportunity to have come here and how much I have learned by listening to agricultural economists talk. In fact, until I heard Chester Davis speak this morning, I didn't even know that hay was something you put up. I thought it was something you cut down. (laughter)

Chester Davis: Well, I want to express my appreciation to the members of the very wonderful panel for their cooperation and their patience. I certainly want to express on behalf of all of us our appreciation for the patience and the interest of the audience. I, too, am glad to have been included. Thank you very much.

UNITED STATES TECHNICAL ASSISTANCE TO FOREIGN AGRICULTURE

Chairman: H. C. M. Case, University of Illinois

A REVIEW AND CRITICISM OF UNITED STATES PARTICIPATION IN AGRICULTURAL PROGRAMS OF TECHNICAL COOPERATION*

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TECHNICAL cooperation in agriculture, in this paper, means all of those activities (other than importations of capital) that aim primarily at agricultural development in a country, and in which a nonprofit agency external to the country is a co-operating partner. This excludes economic aid from our consideration, and focuses attention on those programs in which U. S. technicians operate through one or another type of *educational* process.

Technical cooperation has proved to be exceedingly complex, both in the United States and in countries in which programs operate. Consequently, there have been false starts and conspicuous mistakes. But world conditions and the present position of the United States in world affairs are such that technical cooperation is a process that must be mastered. The world has taken too much to heart America's professed belief in equality of opportunity, and has become too determined on substantial economic progress, for it to be politically feasible for the United States to withdraw its participation in these programs. We have been believed; now we must produce.

Factors in Agricultural Development

Agricultural development, in this paper, means the processes by which an agriculture becomes more efficient or by which the total agricultural product of a country is increased, with or without a change in efficiency. This latter case is important in many underdeveloped countries that have substantial land resources not now transferable to nonagricultural forms of production.

In the United States, we are accustomed to the fact that agricultural development depends on simultaneous progress along a number of different lines: constant research; elementary and advanced agricultural education; extension education; the development of transportation; availability

* In the original, this paper included mention of U. S. activities other than technical cooperation which help other peoples improve their agriculture. Those sections have been eliminated here, in the interest of brevity.

of implements, fertilizers, seeds, insecticides and motive power; control of pests and diseases; agricultural credit; and appropriate public policies with respect to prices, taxation, land tenure, etc.

We quickly run into additional requirements when we attempt to stimulate agricultural development in many other countries. One of these is the widespread need for elementary general education. General health and physical vitality emerge as prime requirements for agricultural development where malaria and intestinal parasites are endemic. Standard weights and measures, which we take for granted, do not exist in many parts of the world. Efficiency of public administration, including civil service tenure for agricultural scientists, adequate salaries, appropriate budget procedures, and efficient administrative procedures is another requirement for agricultural development, because of the effect these have on public program in the fields of agriculture, education, and health.

Beyond these, there are general characteristics of many cultures that have profound repercussions on the rate of agricultural development. One of these is the fact that, in most underdeveloped countries, there is a virtual chasm between a small elite that dominates the government of the country and a large mass population comprising the labor force of both farms and cities. This division of the population means that most of the *public* decisions affecting agriculture are made by the elite, whereas most *farm-management* decisions of agricultural firms and households are made by the larger, much less educated, politically impotent mass.

A second important characteristic of the cultures of most underdeveloped regions is the fact that their agricultural economies are traditional rather than choice-making. The prevailing pattern is for each new generation to be initiated to the care of traditional crops, in traditional ways, with traditional tools and implements. People are not encouraged to weigh alternatives and to make choices, yet it is these processes of weighing alternatives and making choices that are central to agricultural development.

My point here is not so much that traditions must be changed as it is that such changes involve what amounts to a cultural and psychological revolution. Even the motives for change are different, since, in economic parlance, most farm units in underdeveloped regions are households; they are not firms. Millions of farmers do not decide how much of what crops to raise on the basis of relative profitability, but on the basis of usefulness in family consumption.

Considerable confusion exists at this point as to the role of technical cooperation. On the part of many people in the United States, there has been an assumption that all that poor countries need to increase agricultural production is to master the techniques and adopt the implements, fertilizers, etc., the more advanced agricultural economies have

learned to use. This assumption ignores the degree to which economic productivity is a function of the whole way of life of a people. Meanwhile, a widespread attitude in agriculturally underdeveloped regions has been that "we want modern techniques of agriculture but we insist that our traditional culture must be kept intact." This attitude is equally untenable. Important noneconomic aspects of each regional culture must change, both as a result of the specific new techniques introduced and as a precondition to more rapid agricultural development.

There are really two kinds of resources for agricultural development. One of these is the resources we usually associate with agricultural production: land, labor, and capital. These resources must be *economized* because they are limited in quantity and the use of them for one purpose precludes their use for another. There is another type of resource, however, of which this is not true. We may term these *self-generating* resources, since they are not consumed but tend to be augmented by use and need not be economized. The awareness of farmers that they need not be bound by traditional practices but can make new choices is contagious. The confidence of a few political leaders that the long neglected masses include thousands of persons with powers of creativity, innovation, and good judgment can spread to others until it can become a crusade that changes the values of the traditional culture in ways that support and encourage agricultural development.

The importance of these self-generating resources can be seen in many places. The effects of the Mexican Revolution still infect and inspire Mexicans in many walks of life. In India a drastically different spirit has arisen throughout both the countryside and the government within this first decade of Independence. In the Office of Special Studies in Mexico and in the bilateral *servicios* of several Latin American countries local technicians have found a new vocation in public programs for agricultural development in which their initiative is encouraged and their opinions are honored. Tens of thousands of farmers scattered throughout many lands have a new attitude of learning the ways of nature, of taking responsibility for choosing among alternatives, and of participating in public decisions affecting agricultural development.

In recognizing these two types of resources for agricultural development, we realize that the resources of a region are less rigidly limited than we might have thought. Resources must still be economized, but there are other resources, of the spirit, if you will, that are of enormous influence on the rate of agricultural development and these increase in amount in direct proportion to the degree to which they are used.

This review of the requirements for agricultural development adds up to a realization, first, that there are many of them; second, that important requirements for agricultural development are noneconomic, being mat-

ters of public administration, cultural values, and qualities (attitudes) of people; third, that agricultural development does not depend on farmers and agricultural technicians and institutions alone but on the culture—the whole way of life—of a people.[1]

Since the objective of technical cooperation in agriculture is agricultural development, its emphases may properly be placed on any combination of the above factors that satisfies three criteria:

(1) a program the country *needs,*

(2) a program the country *wants,*

(3) a program that utilizes the distinctive advantages of the *process of technical cooperation.*

American Agencies of Technical Cooperation

The International Cooperation Administration (Point 4) has the largest and the most numerous programs. In 1955, 860 American agricultural technicians were employed abroad in ICA programs. The total expenditures on the programs in which they were engaged were of the order of $45,000,000.[2]

The oldest of these Point 4 programs are in Latin America, where the Institute of Inter-American Affairs and the Office of Foreign Agricultural Relations began agricultural programs in 1943.[3] Bilateral programs in other parts of the world were begun in Europe in 1947, and in Asia and Africa in 1950.[4]

Next in size are the programs of the endowed foundations. The strong emphasis of the Rockefeller Foundation on agricultural programs abroad began with its cooperation in the Office of Special Studies in Mexico in 1943. By 1955, it had programs (chiefly in the field of research) in Mexico, Colombia, India, and the Far East, with total annual appropriations of the order of $1,000,000.[5] The Ford Foundation began international opera-

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[1] The factors presented in the foregoing section are discussed at much greater length by the author in *Technical Cooperation in Latin American Agriculture,* University of Chicago Press, to be published in December, 1956.

[2] Estimate calculated at about one-third of the total expenditures on technical cooperation, based (1) on the fact that in Latin America the percentage spent on agriculture was somewhat higher than that, and (2) on a chart on page 22 of *Report to Congress on the Mutual Security Program,* for the six months ending December 31, 1955.

[3] There had been a few agricultural activities abroad under the Interdepartmental Committee, the Bureau of Plant Industry, etc. before that date.

[4] United States bilateral programs operate chiefly through providing agricultural technicians and by providing supplementary appropriations for operating programs. In some cases, these programs are jointly administered, as in the *servicios* in many Latin American countries. In other parts of the world, the operating programs have been administered by the host governments, with the U. S. technicians serving as avisors. In most Asiatic countries, technical cooperation through ICA has been further supplemented by economic aid.

[5] Estimated from the approximate appropriations to the programs in Mexico and

tions in the fields of agriculture and rural education in 1951. Its largest program in a single country has been in India, and by 1955 it had rural projects in five countries, with total appropriations of about $6,000,000.

The American International Association has been conducting supervised credit, general extension, and other agricultural programs in Brazil and Venezuela since 1948, and has now begun to operate in India. The Council on Economic and Cultural Affairs has been in operation less than two years, but is developing a substantial program in the Far East, India, and Pakistan, primarily in strengthening teaching and research in agricultural economics.[6]

Third, in point of size, is participation by the United States in the Food and Agriculture Organization of the United Nations. FAO in its technical cooperation program operates chiefly through providing the services of experts on request to member countries. Only occasionally does it make substantial grants for project costs.

The United States also participates in the technical assistance program of the Organization of American States. The agricultural program of OAS is in two projects. One is "Technical Education for the Improvement of Agriculture and Rural Life" operating from three regional centers, in Havana, Lima, and Montevideo. The other is the Pan-American Aftosa Center in Brazil.

The over-all size of the agricultural projects of religious agencies is difficult to state since both the personnel and the budgets for these are often intermingled with other programs and budgets. In the past, these projects preceded, by many years, other programs of technical assistance. Today, they have two major points of significance: (1) they have a tendency to work with the poorer people in each country, being under no compulsion to show results on aggregate national agricultural output; (2) they are part of integrated programs which recognize the interdependence of economic, cultural, and spiritual factors in agricultural development.

The other private agencies of technical cooperation are many and various. Most prominent in agricultural programs are the Near East Foundation (with programs of general rural development in the Middle East), International Development Services (with programs of supervised credit and rural extension in Latin America and Iran) and World Neighbors (with multi-purpose programs in the Middle East, India, and the Philippines).

Altogether, in 1956, about 1,100 U. S. agricultural technicians are work-

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Colombia, and the grants in the field of agriculture which were reported in the first three quarterly reports of the Foundation for 1955.

[6] While the Mexican and Colombian programs of the Rockefeller Foundation, and the Brazilian and Venezuelan programs of AIA, have been jointly-financed and jointly-administered operating programs, the endowed foundations have operated chiefly through the device of grants-in-aid, without providing personnel or sharing directly in project administration.

ing abroad, and the budgets of programs of technical cooperation, both public and private, total about $60,000,000.

American Agricultural Activities in Technical Cooperation

No two programs of technical cooperation are identical and no two of them should be the same. The great differences among countries in economic resources, in stages of agricultural development, in political institutions and patterns of public administration, and in general cultural values require different emphases by different programs of technical cooperation. When technical cooperation comes to a country, it ought either to strengthen or to supplement domestic programs already in operation. There are no universal criteria to determine which choice is the right one.

1. *Research.* Agricultural research has been a prominent feature of many programs of technical cooperation. Research on kenaf was the sole interest of the ICA program in Cuba through 1954. In Paraguay, the founding of an experimental farm was the first activity of IIAA in 1943. Nearly all programs of ICA in Latin America now have some emphasis on agricultural research. A number of the experts provided by FAO have had the assignment of strengthening research programs in individual countries.

Two features of research activities in technical cooperation have proved to be particularly important. One is a policy of putting a reasonable amount of effort into problems of immediate concern to farmers, and of getting the results of such research publicized fairly quickly. This is important because many countries do not realize the value of publicly financed agricultural research, and only a growing public awareness of this value can build public support for continuing, domestic research programs.

The other is a closely associated program of apprentice training and/or early integration of local technicians into the staffs of these programs. Such training can provide an immediate supplement to inadequate college training in agriculture, and can build a cadre of technicians who can carry on in wholly domestic programs. The "model" research program in technical cooperation is that of the Rockefeller Foundation in Mexico.

2. *Extension education.* Extension education in agriculture and home economics was practically nonexistent outside of the United States, Canada, and a few European countries up to 1940. This explains why extension education is the most nearly universal activity of programs of technical cooperation in all countries and by all agencies.

In addition to its early effect on agricultural production, extension education has special importance in increasing the *self-generating* resources for agricultural development. Where traditional agriculture predominates, farm families need to be confronted by alternatives and supported during

the first difficult period of making decisions and accepting the consequences. Only so can farmers develop a contagious confidence in the application of knowledge to farm problems. Extension education can also change the attitudes of the elite of a country by demonstrating the initiative and good judgment of which the farming population is capable.

3. *Reimbursable facilities.* As extension education proposes new practices, farmers need new implements, seeds, fertilizers, and insecticides. In many underdeveloped countries, these agricultural requisites are unavailable or difficult to get. As a result, many programs of technical cooperation contain activities called Reimbursable Facilities. These include the importation, distribution, and sale of seeds, fertilizers, tools, insecticides, breeding stock, and livestock medicines.

Because this activity is considered a function of private business in the United States, projects of reimbursable facilities within technical cooperation have been subjected to considerable criticism. This criticism is unwarranted. Village merchants are not eager to invest in inventories of new articles just because an extension agent says there may be a demand for them. Demonstrating this demand through temporarily meeting it has been proved an effective stimulus to the opening and widening of commercial channels for agricultural requisites. After examining the records of a number of such projects in Latin America, I know that their record for going out of business as rapidly as commercial merchants move in is good. There is no question that these projects have greatly accelerated the widespread use of many of the requisites necessary to a dynamic agriculture.

4. *Machinery pools.* In several countries, programs of technical cooperation have operated machinery pools.

Where mechanization is sound, both its validity and its commercial possibility must be demonstrated. Two substantial examples of machinery pools are those in Bolivia and Peru. That in Bolivia is playing a pivotal role in opening the eastern plains of the country to agricultural production. That in Peru has operated chiefly on existing farms in the irrigated coastal valleys. Operating more than a hundred tractors, the activity is self-supporting. It has greatly stimulated tractor and implement importation and sales to private operators, a number of whom now do custom work with their equipment.

5. *Agricultural education.* The earliest form of United States help to foreign agricultural education was through schools and colleges partially or wholly supported through private agencies. Outstanding examples of these are the College of Agriculture of the University of Nanking, the Allahabad Agricultural Institute in India, the Higher School of Agriculture at Lavras, Brazil, and the American Farm School in Greece.

Next came support through grants-in-aid and fellowships for faculty

study abroad by endowed foundations. The Rockefeller Foundation and the Ford Foundation have both given substantial aid in these ways, with grants in aid being used often for the purchase of equipment, frequently to support specific projects of research, and occasionally for the construction of new buildings.

Most recently, the university contracts of ICA have been added to these types of cooperation in agricultural education abroad. Some have been much more effective than others. They are now operating widely in Latin America, Asia, and the Far East, and there are a few in Africa.

6. *Home economics.* Much too little recognition has been given to farm family welfare *as a caustative factor in agricultural development.* We have tended to look on welfare as a result of production which, to a degree, it is. In doing so, we have largely ignored the effect on agricultural development of rising family aspirations for better living. Particularly in the least developed regions, people need strong incentives to change, and family aspirations for better living, accompanied by increasing competence in the techniques of achieving it, are extremely important.

Home demonstration agents have been established in Brazil, Peru, Bolivia, Paraguay, Venezuela, and Haiti in Latin America. A department of home economics has been established in the Rural University of Minas Gerais in Brazil. The Ford Foundation has helped establish a college of home economics in Pakistan, and has strengthened several colleges of home economics in India. The American International Association has given a major place to home demonstration agents in all of its rural programs. The University of Puerto Rico has provided training for women from many Latin American countries, and a number of Puerto Rican women have served in technical cooperation posts in other countries. Home economics education has been stressed within the operation of several university contracts of ICA.

7. *Irrigation and land development.* Although most technical cooperation deals with problems of utilizing the existing economic resources for agricultural development, considerable efforts have been devoted to helping augment these resources. In irrigation, the chief activities have been in helping survey possibilities for new projects and in the technical design of necessary structures. A badly neglected field in many countries and in most of technical cooperation is that of efficiency in the use of irrigation water. One project which is tackling this problem is that under the State University of New York contract in Israel.

Land development activities include the clearing of land for cultivation, the levelling of land for irrigation, drainage, and demonstrations of the economic use of new regions. In most such projects, all costs other than technical advice are normally borne by the host government, or are defrayed by the individuals owning the land.

8. *Supervised credit.* The need for agricultural credit is widely recognized by the governments of most countries, and numerous institutions have been established by domestic governments in attempts to meet this need. The most conspicuous contribution through technical cooperation in this field is the introduction of supervised credit programs. The outstanding project of this type is that of the Association for Rural Credit and Assistance in Brazil,[7] aided by AIA. Other such projects, aided by ICA, International Development Services, or FAO have been established in Paraguay, Peru, Bolivia, Honduras, and Iran.

9. *Specific problem consultation.* The foregoing examples of activities within technical cooperation have been in broad fields in which new programs or long-term cooperation with established programs is important. Much of technical cooperation, however, has consisted of short-term consultation on specific problems. ICA has done some of this, but such consultation has been a much larger item in the program of FAO. The list of problems on which such help has been given would be very long, ranging from problems with respect to individual crop and livestock diseases through problems of land reform, agricultural legislation, vaccine manufacture, the installation and operation of pasteurizing equipment, and the design of new schools and experimental stations.

Techniques and Institutions in United States Programs

No issue with respect to activities in technical cooperation is more important than the need for stable *institutionalization* of programs for agricultural development. The introduction of individual techniques is likely to have only ephemeral value unless there is sound organization to assure its continued utilization. This issue was well summarized by one technician in the field:

> "When we came here, we thought we should stay until we had trained men in the necessary research techniques to carry on this program. Now we realize that we must stay until the government and public . . . are ready to continue to support this research program and to assure it appropriate administration."

Not only must farmers learn new methods, but peoples must develop an understanding of the necessities for agricultural development and must establish the institutions for the required public programs, firmly provided with sound practices of administration, before the work of technical cooperation can be said to have been consolidated.

Achievements of Technical Cooperation

On the whole, programs of technical cooperation have produced achievements fully commensurate with their cost. However, this judg-

[7] See Chapter VIII, *Technical Cooperation in Latin American Agriculture, op. cit.*

ment cannot be substantiated by quantitative data. The great variety of programs precludes any aggregation of their results except in descriptive terms. Many programs of technical cooperation operate at an early stage of agricultural development in which changes in attitudes and in institutions, usually but not always slow, are frequently more important than any quick changes in production figures. Programs of technical cooperation are always supplemental to domestic programs, and they are facilitated or retarded by factors beyond their control such as the vigor or somnolence of commercial salesmanship, the adequacy of means of transportation and communication, and prevailing patterns of political organization and of public administration. This fact makes it impossible either accurately to impute changes in agricultural production to single agencies, or precisely to place responsibility for the seeming failures of particular activities. Finally, much of the task of technical cooperation is education, in a broad sense, and there is no conceivable way to place a present monetary value on the future fruits of educational efforts in the past.

What can be affirmed with confidence is that appreciable agricultural development has been taking place in most of the countries in which programs of technical cooperation have been active, and in directions in which technical cooperation has been trying to move. Beyond this, and short of an extremely long and heterogeneous recital of specific results achieved by particular programs in many countries, all that can be done is to list the kinds of achievement for which U. S. participation in programs of technical cooperation must be given a share of the credit.

1. *Technical cooperation has helped to raise agricultural production and increase agricultural efficiency by introducing and developing improved agricultural techniques.* Examples of this are the development of hybrid and synthetic varieties of corn in Mexico, the distribution of Cuban Yellow corn in Peru and Bolivia, the increase in potato yields through the use of insecticides and fungicides in Andean countries, and the popularization of mechanization in Peru.

2. *Technical cooperation has aided in creating many new domestic agencies for agricultural development and it has increased the effectiveness of agencies already established.* Throughout much of the world the U. S. has been helping to establish new agricultural extension services. In Latin America, many ministries of agriculture and programs of agricultural research have been launched with the support of, or under the influence of, technical cooperation. The National Economic Council of Honduras, the Corn Commission of Mexico, and the Northeast Association for Credit and Rural Assistance of Brazil are all examples of such new domestic agencies for agricultural development. Beyond these, the experts

of FAO and technicians of most other agencies have aided in strengthening numerous existing institutions.

3. *Technical cooperation has greatly increased the supply of competent agricultural technicians in underdeveloped countries.* It has done this through fellowship programs, through the experience local technicians have gained through collaboration with foreign technicians and through the many varieties of help given to domestic programs of agricultural and home economics education.

4. *Technical cooperation has provided a more productive and stimulating professional atmosphere within which existing trained technicians can work.* Where ministries of agriculture have low standards of administration, with low salaries, political favoritism, and inadequate working equipment, technical cooperation has created temporary "islands" of greater professional opportunity. In other instances, foundations have enlarged the opportunity of well-trained agricultural scientists through grants for equipment or for specific research projects.

5. *Technical cooperation has injected "detached participants" from outside of traditional cultures into programs for agricultural development.* This is one of the special contributions which foreign technicians make to a country in programs of technical cooperation. They see problems from a fresh angle because they come from outside of the culture. Being foreign to local conditions can lead to foolish proposals, but it can also lead to a creative consideration of contrasts. It stretches the innovative imagination of both foreign and domestic technicians.

6. *Technical cooperation has appreciably increased the self-generative resources for agricultural development.* No small injection of specific new techniques can, simply because of those techniques, have any major effect. But when relatively small projects within programs of technical cooperation have a pronounced effect on the attitudes both of farmers and of a political elite toward agricultural development, the new attitudes so engendered, and the consequent greater activity and concentration of effort which these attitudes, in turn, bring about, can speed agricultural development out of all proportion to the amount of the foreign financial contribution in technical cooperation.

The Distinctive Roles of Different Agencies

It is probable that the endowed foundations and similar organizations, have, within the limits of their resources, the most advantages of all agencies of technical cooperation. They are not suspected of ulterior motives, whether political, commercial, or evangelistic. With assured sources of income, they need court neither current contributors nor governmental appropriations. Being nongovernmental they may cooperate,

at their pleasure, with private organizations in host countries, or with state, local, or national governments. They can make long-term commitments.

The international agencies, FAO and OAS, have the advantage that they are not suspected of nationalistic political or commercial motives. Of all agencies of technical cooperation, participation in them is most nearly mutual. But they have limited financial resources and they are subject to policy determination by country delegates many of whom are not agricultural technicians. FAO has the further disadvantage that, with world-wide responsibilities, it is difficult for it to establish the different policies for different regions and types of countries circumstances call for.

U. S. bilateral technical cooperation through ICA has the advantage that it has the largest financial resources of any agency. It has, second, the advantage, in theory at least, of being relatively free to tailor its programs to the needs of individual countries. IIAA, and, later, the Technical Cooperation Administration once were able to do this in fact. Since 1953, however, under FOA and ICA, a passion for integration and a practice of standardization, aggravated by increasing requirements that more and more policy decisions be made in Washington, have largely forfeited this potential strength of bilateral programs.

Against these strengths of ICA must be set certain weaknesses. One is the fact that it is often suspected of nationalistic political or commercial self-seeking. Another is that it must defend itself annually before legislators and a general public who know far too little about either the problems or the mechanics of technical cooperation. Third, like the international agencies, being wholly dependent on annual appropriations it cannot make firm commitments or plans for a continuing program over a period of years.

The Shortcomings of Governmental Programs[8]

1. *The United States has not found, or adhered to, an appropriate type of organization in Washington for its bilateral programs of technical cooperation.* The headquarters organization and administration that bilateral technical cooperation needs are easy to outline but difficult to achieve.
   1. Technical cooperation needs an organizational form honoring its relationships to long-term U. S. foreign policy but insulating it from short-run political and commercial considerations.
   2. It needs a type of administration that delegates wide authority to

[8] Only governmental programs are considered in this section, since it is these which are subject to, and responsive to, general public opinion and decisions within the political process.

field administrators in project selection, in determination of personnel requirements, and in day-to-day administration.

3. It needs a headquarters responsible primarily for: (a) budgetary allocations among country programs; (b) much more imaginative and effective personnel recruitment and orientation than has, so far, been achieved; (c) negotiation of contracts with universities and private agencies; (d) continuing analysis and study of country programs with frequent consultation with the chiefs of field party in the various countries of operation; and (e) administrative housekeeping that serves field programs promptly and effectively.
4. It needs the assurance of long-term U. S. participation, reflected in standing legislative authorization of appropriations.[9]
5. It needs more timely annual appropriations.

Instead of these characteristics, however, we now have technical cooperation buried in an agency responsible also for military and economic aid, and receiving a degree of attention conditioned by the fact that only 7.2% of the total funds of the agency (other than for direct military aid) are for technical cooperation. The Republican argument for this integration is that all of these activities can be called "foreign aid." By similar logic, we may soon expect to see the Civil Aeronautics Board, the Air Force, and the ornithological activities of the Wild Life Service amalgamated in a single agency, since all of them involve flying. We have a policy that reverses the standing authorization for appropriations for technical cooperation developed under the Act for International Development and makes the continuation of technical cooperation subject to annual authorization, as well as to annual appropriations. We have a congressional practice that frequently delays the annual appropriations until after the fiscal year to which they apply has already begun. We have virtually no built-in provision for continuing study and review of these programs by qualified analysts. The trips that headquarters personnel make to individual countries are brief and frenzied, and deal almost exclusively with minor administrative matters or with selling standardized policy decisions manufactured in Washington.

2. *Major field needs of bilateral programs of technical cooperation have not been met.* Four of these are outstanding. The degree of autonomy and policy discretion formerly granted to chiefs of field parties in individual countries needs to be restored. Adequate provision needs to be made for constant study of these programs and for frequent regular visits to country programs for consultation by a staff of top-flight scientists

[9] It had this under the Act for International Development (1950) but this was withdrawn by the Mutual Security Act of 1954. This withdrawal was part of the adverse effect on technical cooperation resulting from its administrative integration with economic and military aid.

(social, as well as physical and biological). There needs to be provision for additional study and training for technical cooperation personnel on (extended) home leaves. There needs to be more cross-fertilization of ideas by visits of technical cooperation personnel to other countries with problems similar to those in the countries to which they are assigned.

3. *Much too little attention has been paid to the importance of the self-generating resources for agricultural development.* We have thought too much in "economic" terms in fashioning and assessing programs of technical cooperation. Without abandoning the insights of economic analysis, we must find a way to give more adequate recognition and attention to the noneconomic aspects of the culture of the people of each country which generate and undergird economic effort.[10]

4. *Our shortcomings with respect to the programs of FAO and OAS have been partly in amount of support, but more in its uncertainty from year to year.* This shortcoming has been greatest with respect to FAO. Although the support of these programs must be truly international, we have not kept pace with the slowly increasing appropriations by other countries, and we have found no way to assure the continuation of our support over a period of years.

(It is ironic that the United States of America, which saw in its self-vaunted genius for invention and innovation a contribution which it could make to raising living standards in other countries through technical cooperation, has so far shown so little ability to create the organizational machinery necessary for administering such programs. If we are as creative as we think and say we are, surely we should be able to solve this one.)

Perspective in Technical Cooperation

Technical cooperation in agriculture needs to be seen in perspective. It is an important new activity in international relations and in the process of agricultural development. Along with a recognition of what it can achieve we need to keep in mind its limits and its complementarity with other activities affecting agricultural development. We also need to recognize the noneconomic considerations contributing to its validity.

The complementarity of technical cooperation is broad. Technical cooperation can make contributions of crucial importance but it is always supplemental to two other types of activity which, quantitatively, are much more important. One of these is the private efforts of farmers, merchants, manufacturers, bankers and the transportation industry of each country in improving the efficiency of one or another of the many elements in agricultural development. The other is the domestic govern-

[10] See W. Arthur Lewis, *The Theory of Economic Growth*, Richard D. Erwin, Inc., Homewood, Illinois, 1955, especially Chapters II and III.

mental programs of each country devoted directly or indirectly to the same ends. Moreover, even within the field of technical cooperation it is important to recognize the contributions to agricultural development of programs of general education, public health, transportation, and industrialization.

Finally, technical cooperation in agriculture can only rightfully be viewed as an activity springing from motives and world necessities much broader than that for agricultural production alone. The interest of the United States in technical cooperation and appropriations for public programs have fluctuated with the intensity of concern about World War II and, later, about the cold war. But public programs of technical cooperation were bound to arise, quite apart from the recent tensions between the Free World and the Communist bloc. Anticipated by the religious and humanitarian concerns that supported the programs of agricultural missions, they were sure to come as public programs because of the social and political philosophies of democratic countries and because of the awakening of men everywhere to a determination to achieve more adequate levels of living.

Today, United States participation in technical cooperation is a test of our national integrity with respect to our own professed way of life. It behooves us to understand these programs, using our technical knowledge and our tools of economic analysis to the extent that these are valid to the task, but realizing always that the subject we examine here is part of the indivisible web of human aspirations, political evolution, and total world culture within which we live.

SECTION MEETINGS

UNITED STATES TECHNICAL ASSISTANCE TO FOREIGN AGRICULTURE

AREA SECTION A. PROBLEMS IN HIGH-POPULATION, HIGH-TECHNOLOGY, LOW-INCOME COUNTRIES (PARTS OF WESTERN EUROPE AND JAPAN)

Moderator: L. F. Miller, Oklahoma A and M College
Rapporteurs: B. F. Johnston, Stanford University and
R. P. Christensen, Agricultural Research Service, USDA

Panel Members: K. L. Bachman, Agricultural Research Service, USDA
J. L. Buck, Council on Economic and Cultural Affairs, New York
K. T. Wright, Michigan State University
M. G. Smith, Ohio State University
L. I. Hewes, Jr., Bureau of Reclamation, Denver, Colorado

K. L. Bachman, who presented the first of the opening statements by panel members, pointed out that each person who goes abroad to engage in technical assistance work has different experiences and observations. His particular vantage point was Paris where he worked with agricultural problems of the northern and southern European countries participating in programs of the Economic Cooperation Administration (later MSA, etc.). Certain contrasts among these countries stand out. First, there is the matter of attitudes of the ruling groups in government and business. In the southern countries there is a tendency to look upon agriculture as a separated group and to regard its problems as of secondary importance. Consequently, there is a need in such areas for recognition of the importance of balanced economic growth and for better relations among farmers, officials and professional people. Second, there is often a lack of understanding in the southern countries of what it is that brings about increases in production and productivity. It is easy to see the large physical improvements such as irrigation structures, but improvements in hand tools, seeds, livestock, cultural practices, and other minor practices are not so evident although the latter often may be the most economic in achieving enlarged production and higher productivity. The basic need for recombination of resources together with improved practices is often neglected. Third, there frequently is failure to integrate the farm production process with processing, transportation and other marketing functions. Exports to other countries would often be possible if marketing facilities and practices were developed.

S. E. Johnson, Agricultural Research Service, raised a question about whether or not any country had been successful in recent times in negotiating a substantial "break through." Bachman listed Austria as a country he had observed making rapid progress although it probably cannot be called a low-income country. T. R. Hedges, University of California, pointed out that Turkey and Greece have made substantial progress.

J. L. Buck described his experience in establishing a Department of Agricultural Economics at Nanking University, China. Beginning in 1920 he taught agricultural economics from American textbooks for about one and one-half years. This was unsatisfactory. The American textbooks provided the principles but not the needed illustrations. Therefore, farm surveys were initiated to give students experience in collecting information needed for economic analysis. In 12 years enough people had been trained to develop a department under Chinese leadership. The value of information obtained by the survey method was widely recognized by government and other officials. This was illustrated by reference to the survey of damages caused by a flood in 1931 that flooded out about 25 million farmers. Based on findings of this study, which were published, a program of government aid was established.

David Weeks, University of California, asked "How rapid is it economic to mechanize farms in countries like China or Italy?" Buck replied, "As fast as it pays." Weeks commented that there has been a naive emphasis in some technical assistance programs to push mechanization, for the sake of mechanization. Buck quoted A. B. Lewis's observation, "We have given too much attention to taking the fruits of our technology abroad and not enough to taking the seed."

K. T. Wright described his experience with work in agricultural economics in Great Britain in 1951-52. He pointed out that farmers in the United Kingdom are in a country of high population and high technology, but they are not low in income. He felt, however, that the development of an expanded and highly successful program in agricultural economics in Great Britain in recent years might be of general interest. Wright explained that he was located at Nottingham University. Others in the American group included O. J. Scoville at Cambridge University, R. G. Wheeler at the Department of Agriculture of Scotland, Carl Malone at University of Wales, and R. P. Christensen at Oxford University. Wright described briefly the assignments carried out by each and referred to an article, "The American View of Agricultural Economics in Great Britain," by Leonard Napolitan in the British *Journal of Agricultural Economics*, which provides an English appraisal of the American suggestions. Napolitan pointed out that the Americans came with no ready-made panaceas and that they emphasized the mutual benefit of continuing arrangements

for exchanges of agricultural economists between the two countries. However, Napolitan noted a tendency for the Americans to be very ambitious in suggesting activities for British agricultural economists and to overlook limitations of personnel and budget.

Henry C. Taylor, Indian-Queen-on-the-Potomac, asked if British agriculture is becoming more, or less, intensive. He noted that his visits to certain British farms in 1899, 1925, and 1954 seemed to suggest a tendency to move toward a more extensive agriculture. Wright indicated that percentage increases in total farm production during the last 15 years have been about as large for Great Britain as for the United States. He also pointed out, however, that his own observations were limited to one point in time. In general discussion reference was made to the rapid increase in mechanization and in fertilizer use. The view was also expressed that there has been some tendency for British farmers to suffer from their attitude concerning the "sacredness" of the grass crop.

M. G. Smith, Ohio State University, expressed the view that the problems of agricultural development are essentially the same in the three categories of countries discussed by the three panel groups. He raised the question whether or not it is proper to characterize a country as having "high technology" and at the same time "low income." He then suggested that this apparent contradiction may mean that development in agriculture has moved ahead of development in the rest of the economy. Smith pointed out that the "high-population, high-technology, low-income" countries face, in more acute form, the problem raised by Schultz: surplus farm population and the need to move labor resources out of agriculture. This requires movement into industry, new settlement projects, or outward migration. He emphasized that high population is the critical problem in these areas and expressed doubt that we have a satisfactory answer to this problem. Smith also called attention to the fragmentation of farms and to the prevalence of units of uneconomic size resulting from population pressure.

Apropos of the population problem, L. F. Miller quoted Jacob Viner's warning in his book *International Trade and Economic Development*: "Population increase hovers like a menacing cloud over all poor countries. It can offset, and more that offset, the contribution to economic prosperity which all other factors can make."

L. I. Hewes reported on his experience in Japan. In thinking about technical aid it is important to consider, what does the country itself really want and what does the United States want? The people of Japan undoubtedly want their country to recover its economic position as a prominent world power, implying increased competition for U. S. producers. Recent hearings before our congressional committees indicate

that our objectives are not quite the same as those of the Japanese because of attitudes in this country with regard to such potential economic repercussions. Land reform had long been a felt want among the Japanese people and the Occupation's role in bringing about the land reform program was essentially that of a "midwife." Land reform after the war has had two important effects: (1) incomes of farm families have increased, and (2) the status and political influence of farm families have been increased so that the opinions, needs, and wants of farm people are expressed more effectively. A principal long-range effect of land reform has been to enlarge the scope of decision making by individual farmers. In the past there has been little study of farms in Japan as individual operating units, and there is much need for study of the individual farm firms in relation to improved management, supervised credit, and production and marketing techniques. A significant opportunity now exists for Japanese extension workers to devise adequate individual farm and home plans. American technicians should recognize the acute and complex natural resource problem of Japan. Growth of large cities is causing them to expand into fertile land around the cities, and some of the less productive land in mountainous areas is being brought under cultivation. This raises problems of land and water use. Population growth is rapid, causing large deficits to be met by food imports and increasing Japan's dependence on a large volume of foreign trade. Land reform has only facilitated solution of these problems to a limited extent. On the whole gains in any one direction probably will be small.

Moderator L. F. Miller noted that not much time remained for discussing problems of training foreign students. He asked K. T. Wright to comment briefly. Wright noted that from 30,000 to 40,000 students come to the United States for training each year. They usually have little knowledge about the United States and need more orientation before they come and especially after they arrive in order better to understand what they observe here. The instructional program at most universities is designed for American students who usually have needs quite different from those of foreign students. Serious consideration might well be given to establishing special courses at a few universities for foreign students in agricultural economics.

AREA SECTION B: PROBLEMS IN HIGH-POPULATION, LOW-TECHNOLOGY, LOW-INCOME COUNTRIES (ASIA, EXCLUDING JAPAN)

Moderator: O. V. Wells, Agricultural Marketing Service, USDA
Rapporteurs: Robert L. Clodius, University of Wisconsin
Carl P. Heisig, Agricultural Research Service, USDA

Panel Members: M. D. Woodin, Louisiana State University
C. A. Bratton, Cornell University
L. S. Robertson, Purdue University
John H. Southern, Agricultural Research Service, College Station, Texas
L. R. Martin, North Carolina State College
C. R. Creek, Colorado A. and M. College

Each panel member addressed himself to the problem or problems that seemed representative of his experience in a particular country. The introductory statement of each is presented below:

M. D. Woodin spoke of his observations gained while serving with a technical assistance program in Formosa. The case of Formosa is more like that of Japan than other parts of Asia, perhaps, because of the higher level of technology. This situation stems from the efforts of the Japanese to develop Formosa prior to World War II. It gives the economy a head start in development over other countries of Asia, and has resulted in their receiving a good start toward the resolution of their problems.

At the present time and in the recent past a highly centralized government is trying to make a good showing in agriculture. This is being attempted through major programs of land reform, credit reform, and technical assistance. The United States has participated primarily in the last area. The success of this participation is extremely difficult to measure. Besides the mechanical problem of measurement it is never clear what the United States is trying to accomplish. Without knowing this, how can you measure the success of a program? The upshot is that things have happened in Formosa in agricultural development, but no one can say that it is progress for sure or what the United States' part is.

Woodin concluded his statement by saying that he was not sure that the United States public had received its full dollar's worth of return out of the dollars that had been spent for economic development in Formosa.

C. A. Bratton oriented his statement to his experiences while working in the Philippine Islands on an ICA contract with an agricultural college. There were two problems among the many interrelated ones that took his interest. They are establishing research and educational work.

In the applied research program the first need is knowing what the objectives are. The program should be based on "growth over time"; not

looking for a diagnosis of an immediate "pain" in the economy. Research must set the stage for long-term growth. Also the research must be of a practical and applied nature. There is great danger of going in with U. S. practices and trying to transplant them intact. This often does not work. Opportunities may exist to "adapt" some practices but beware of "adopting" them. Sustained growth and development depends on the search for scientific facts in other countries as well as in the one under consideration.

There are many obstacles to be overcome. One is the lack of qualified personnel to do research. Another is getting researchers to be practical. Many want to tackle only the theoretical or the latest "fashion" in the United States instead of starting with basic things. There is the old problem of getting funds and facilities for research. Finally there is the tendency for the "expert" to want to do the job himself instead of training a counterpart to execute the details.

A second large problem is that of establishing an educational program to reach farm people. Progress comes when people are informed. Knowledge is worthless unless it is taken to those who can use it. This calls for development of an educational system to do the job. The system may take the form of an "extension service" operated through the schools, or it may require separate community or rural development programs.

Here, too, there are many obstacles to be overcome. Many research and college people do not see the value of taking information to the people. Or if they see it, such activities may be "beneath them" intellectually. There is an attitude of "nothing you can do about it anyway" that must be overcome. The development of a better attitude is slow but basic to progress. Illiteracy and the like may call for special methods. Another obstacle is wanting to start with people as they are assumed to be in the developed economies rather than with people as they really are in their local situations. Finally, regulatory activities are lumped with education. This impedes development of the educational program.

In summary the over-all problem is one of providing research to get basic information on local situations and to find ways of taking this information to the people in a way they can use.

Lynn Robertson also drew on his experiences in the Philippines and declared himself to be in agreement with Bratton. Robertson spoke substantially as follows: For high-population, low-technology, low-income countries, a large number of problems in which help is needed can be listed. Each is important enough so that a good case could be made for giving it special emphasis. There isn't any one thing that is the key log to breaking the jam; a lot of improvements must go forward together or progress is stymied by bottlenecks.

For the Philippines two assumptions were made, (1) the primary objec-

tive is a higher scale of living, and (2) the scale of living is limited by production per capita. No country can consume more than the equivalent of what it produces.

The Philippines have low production per capita. Three fourths of the workers are farmers and rice is the most important farm crop. Rice (or palay) production per farmer is low primarily for two reasons: (1) the average lowland rice farmer, specializing on rice, works only about four months a year, and (2) even when he works he uses inefficient hand methods. He takes six to eight times as long as an Arkansas farmer to produce a given amount of palay. A third but less important reason is that the most improved cultural practices, including adapted varieties, fertilization, control of palay enemies, etc., are not followed. No amount of improvement in this phase, however, would overcome the handicap of the two major difficulties of small amount of time worked and inefficient work methods.

The apparent way to overcome the two principal difficulties is (1) to have the Philippine farmer substitute mechanical equipment for inefficient hand methods and (2) to give him something to do when he is not employed in rice production.

This apparently simple solution has five main obstacles. (1) Rice paddies are very small and are permanently diked around the edge. This prohibits mechanization without a complete physical revamping of the land. (2) Farms are too small to make individual ownership of machines economical. The average rice farm is only six to ten acres. (3) Rice farmers do not have capital to purchase equipment. (4) Plenty of labor is available to do the job as it is now done and if machinery were substituted the amount of idle time would be increased. (5) The "know-how" of mechanical production of rice does not exist. Even if the mechanical methods of Arkansas or California were transplanted to the Philippines, they would need considerable adaptation.

Unless all these five obstacles can be overcome, progress toward higher production per capita will be small. Thus effort is required in many fields at one time. Here are the major needs: (1) research and education to know how to get the crop produced efficiently, meaning a change in the whole farm management setup, (2) the introduction of nonfarmer capital or the establishment of credit opportunities to permit the purchase of equipment, or some arrangement for getting mechanical operations performed on a custom or cooperative basis, (3) land tenure and land use reform to get larger farm units, (4) improvements in the marketing program so that rice (palay) can be handled efficiently from the producer to the consumer with the producer receiving optimum returns, involving not only service institutions but also physical facilities for transportation, storing and processing, and, (5) some development to make profitable use

of the already idle man power and of the additional man power that would be idled by the change in rice production methods. Whatever opportunities there are for introducing other crop and livestock enterprises on the same farms need to be exploited. Home handicrafts, although better than nothing, do not constitute a solution to the problem. The problem can be helped by encouraging the movement of part of the surplus population from the heavy-populated rice areas as settlers to productive land still available for settlement in Mindanao and other southern islands. The biggest help in this problem, however, will come through the development of nonfarm industries, particularly those processing the products of the islands.

If there is any phase that can be pushed ahead of the others, it is this last phase—of developing industry to use the surplus of labor. For the highly mechanized countries of the world, mechanization came first in industry and then found its application in agriculture rather than vice versa. No reason is apparent for expecting the situation to be reversed in the Philippines.

Because of the many developments needed simultaneously, progress is bound to be slow for a long time. But the possibilities are challenging.

John H. Southern illustrated his statement with examples from Pakistan. Some differences of opinion between Southern and Robertson were revealed in two areas although they did not become points of issue during later discussion. Southern stated that mechanization should be limited in early development while Robertson believed that the way to increase production of rice is to have the farmer substitute mechanical equipment for inefficient hand methods. In another area Robertson's thesis is that there is no one single thing that is the key to economic development. Southern expressed belief that "purdah of the mind" or the veil drawn across the minds of people regarding what they can or should do was the main obstacle to progress. If the key that motivates people to learn, to accept or to act were found, this could open the way for technical assistance.

Southern's opening statement was oriented to problems of resource development and mechanization. Economic development in general terms is the utilization of resources to bring about a significant and substantial increase in per capita production.

In areas under discussion here, agricultural resource utilization and development are characterized by a great imbalance of factors. In particular there exists an excess of manpower and as a consequence a low output per worker. This means a labor force exists that is much greater than required to produce the same quantity of goods using current production methods. This situation is more acute, or the labor force is proportionally greater, in the more productive agricultural areas.

Flowing from the low level of production is a vicious circle of low level

of income, of low level of consumption, of intense poverty, of small demand for capital, and finally a low level of saving. The main feature relating to technical assistance efforts is that these characteristics exist in an agriculture where possibilities are great for increased production without capital-intensive outlays. By a few changes in production methods with small capital inputs total production may be increased materially.

As a consequence most of the technical assistance to agricultural resource development has revolved primarily around practices to increase agricultural production. In areas where starvation is a constant spectre, where ordinary observations have indicated the possibilities for increased agricultural production, and where the economy is so overwhelmingly rural it has been automatic to attack this vicious circle at only one point, that is, low agricultural productivity. Thus, technical assistance has been by and through measures of fertilization, improved breeds and seeds, better adapted varieties, improved pest controls, etc. The Village-Agricultural-Industrial Development Program (called by various names in different countries) although broader in its conception, in most instances ended up also charging at this one part of the circle.

Aid in mechanization, probably the most desired goal of many governmental administrators in the underdeveloped countries, usually has been restricted to the initial development phases of reclamation or settlement projects. Although mechanization holds this unique and universal attraction for these countries, it, nevertheless, in most instances has been avoided in the U. S. assistance program, and justifiably so.

Certain improvements may be made in the program. Assistance in mechanization should continue to be limited not only for the reasons of economy in resource allocation, but also because the real problems of peasant agriculture would be avoided if the goal of mechanization was pursued.

Village development programs, although broad enough in concept, perhaps could be broadened in practice to include greater emphasis on economic development. The vicious circle described has to be approached from several directions at the same time, including small industries, communications, education, etc.

Greater recognition should be given to institutional and cultural features of technical assistance programs, not only as obstacles to problem solution, but as positive contributions to achieving the objectives of technical assistance. One feature of this assistance to agriculture has been its lack of orientation in a general framework of economic development.

Another aspect worthy of note is that perhaps too much technical assistance has revolved around the panacea of increased food production. In other words, "fill the bellies of hungry people and communism and other ills will disappear." Such is not the case; "belly communism" is a myth.

Generally, agrarian reform of a broad nature has not occupied its particular place in technical assistance to these countries. This should be remedied by common recognition that such aspects of technical assistance are positive in nature, more lasting in their effects, holding greater hope for the objectives strived for by those rendering technical assistance as well as by those receiving such assistance.

Lee R. Martin spoke from a background of experience in Pakistan. His opening statement was substantially as follows:

A democratic system and a capitalistic or mixed economy are assumed. High population, low technology, and low income necessitate first emphasis on agriculture in economic development. Among the reasons for this are: (1) Pressure of population on food and fiber supplies. (2) Necessity of earning foreign exchange for purchase of private and social investment goods. Most of the opportunities for earning exchange lie in agriculture. (3) Necessity of maintaining economic and political stability. Because the greatest proportion of national income originates in agriculture, having stable supplies of food and fiber available will go far in keeping inflation within tolerable bounds. (This also requires early attention to storage facilities unless emergency food supplies can be obtained without using scarce foreign exchange.) Low technology implies low yields per acre, and thus a sizable potential for increasing agricultural output.

How can output be increased as rapidly as possible? Two types of change are required. First, the quantity and quality of production inputs available to cultivators must be increased.[1] Second, equally important and more difficult is the improvement of institutional arrangements facing agriculture. Without steady and rapid progress in this direction, increases in yields are likely to be negligible. The following are needed: (1) An extension service reaching individual cultivators. The magnitude of this task can be appreciated by thinking about reaching effectively and continuously 100,000 rural villages in Pakistan or nearly 500,000 in India! Scarcity of technically trained personnel and inadequacy of training facilities aggravates this difficulty. (2) A rural credit service. In addition to the difficulties of coverage, the average size of loan will be small due to very small farm units, and overhead costs per loan will be relatively high. (3) Land tenure reform. Changes of a drastic nature are needed to provide sufficient incentives to those engaged in agriculture to work harder and more efficiently, and to invest more in the operating units. This is the most important of all.

[1] In Pakistan, this includes irrigation water in more timely quantities, fertilizer, better varieties, disease and insect control materials, better farm implements, more and better marketing facilities, better workstock and other farm animals (developed through breeding, feeding and disease control programs).

Several other points should be made. One concerns mechanization. Although yields need to be raised to high levels (high as those achievable with tractors and auxiliary equipment, or even higher as achieved in Egypt or Japan without mechanization), few underdeveloped countries that must import the tractors and auxiliary equipment, spare parts, fuel and lubricants will be able in the very near future to afford this kind of equipment in very large quantity. It is important that mechanical equipment be imported only for functions that can't be performed economically with internal resources.

Martin is against importing tractors as a general source of power. This conclusion is further buttressed by considering how many million cultivators would be displaced by mechanizing agriculture, or how many billions of rupees would be required to employ *efficiently* outside agriculture those displaced by tractorization. (Rough estimates in Pakistan indicated that even an optimistic estimate of the funds available annually for capital investment would not employ the annual increment in the labor force.)

A second point concerns the use of water in semi-arid regions. Since water is the limiting factor, more attention needs to be directed toward working out the product-maximizing combinations of other inputs with the relatively fixed quantities of water. Tradition seems to favor use of more than the optimum amount of land.

Third, success will bring more difficult problems. Attainment of self-sufficiency in food-grains will bring the necessity for large-scale transfer of resources from food-grain production to diet-improving products[2] and foreign-exchange-earning products.[3] Such a transfer will require a good extension service, a rural credit organization that works, the results of great deal of production research, and above all, a marketing system that would facilitate the transfer of products among cultivators specializing more than at present. Even now, the potential for increasing total agricultural product by having villages, sections or regions specialize is considerable, but the basic information is not available.

Fourth, except for countries on the verge of moving out of this category, initial investment outside agriculture should come for the most part in industries supplying the farmers,[4] and those using the farmers' products as an input.[5]

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[2] In Pakistan, these include sugar, oilseeds, vegetables and fruits, and livestock products.

[3] Such as cotton, tobacco, oilseeds, wool, hides and skins, etc.

[4] In Pakistan, these might include fertilizer, cement, plant protection materials, irrigation materials, electric power, petroleum, seed multiplication, communications, etc.

[5] Such as cotton, wool and synthetic textiles, jute goods, leather goods, cotton ginning, oilseeds processing, food processing including meat packing, lumbering, fisheries, marketing and storage, etc.

What can be done under technical assistance programs to hasten economic development? First, staff work should be carried out carefully in collaboration with officials of the country in order to avoid wasteful mistakes in direction and timing of capital expenditures. Tradition and recent history are likely to dictate spending on more glamorous but, for the present, less vital investments. Second, technical assistance agencies should be able to help more on the institutional side—assisting in developing the institutions that will facilitate agricultural development. These areas of social investment are most likely to be neglected by the country concerned because the returns are less certain and often are not immediately forthcoming. This is where U. S. experience can help most, although developed country techniques must be modified to be fully useful in underdeveloped countries. Especially in these institutions the capital and labor coefficients must be adapted to local conditions.

C. R. Creek also spoke from first hand knowledge gained from experience in Pakistan. The particular subjects to which he addressed his remarks were problems in marketing and prices relative to that country.

Serious transportation problems arise because the country is divided. It would be as though Southern California and Louisiana were under the same political control but overland transportation between the two forbidden. Yet trade between the two is vital. Half of the population lives in East Pakistan where the population density is 800 persons per square mile. This compares with 110 persons per square mile in West Pakistan. East Pakistan has about one third of the total cultivated acreage but four fifths of this is planted to only one crop. The logical development of trade is the movement of food from West to East, and of nonfood products from East to West.

Problems of transportation and other considerations lead to recurring food crises. In food grains rice and wheat comprise over 80 percent of the total. A bumper crop of these grains in West Pakistan can produce a market glut there because of the inadequacy of transportation to food deficit East Pakistan. Similarly a crop failure in rice and wheat can produce famine. Seasonal gluts and shortages are characteristic of fresh fruits and vegetables. Because no adequate processing facilities exist for diverting part of a fresh crop, the problem is further aggravated.

The distribution of food is complicated by many factors. One of these is inadequate grading and inspection. There has been little time relatively since 1947 for this new nation to establish those things that facilitate distribution. Also there is inadequate storage and transport. Finally the activities of speculators and hoarders impede the steady flow of food to market.

There are great opportunities in food processing, particularly in the West. These apply to meat, poultry, eggs, dairy, milling, and fruits and

vegetables. However, the development of the agricultural processing industries is handicapped by the use of Australian methods and primitive equipment.

In the field of prices some problems of black markets have developed because of price regulations and the rationing of sugar and flour.

Certain remedies are indicated by the nature of the problems arising in the marketing situation. Integrated producer-consumer cooperatives could do much to improve the distribution of food. Revised and extended public regulations are needed in grading, sanitation, and inspection. Hoarders, speculators, and in some instances landlords should either be regulated or eliminated. Expanded food processing facilities are needed. Finally agricultural production should be increased on a planned and organized basis.

Creek implicity took issue with the point of view expressed by some panel members that the primary objective is raising production per capita. For a particular commodity this could result in further market gluts. Thus the composition of output is an important consideration in addition to the level of output.

At the conclusion of the opening statements by panel members, Moderator O. V. Wells commented that in his opinion it appeared that Woodin had failed to accept in total A. T. Mosher's brilliant personal statement of faith in the desirability of technical assistance programs. As a taxpayer Woodin apparently has some ups and downs in belief. The panel members who followed also apparently had difficulty in finding a clear statement of the objectives and a yardstick for measuring progress sufficient to satisfy themselves about the program. The examples of other nations such as Great Britain, the Netherlands, and France who had tried to develop these areas and perhaps failed were before them. All panel members expressed the idea that it was better to learn to crawl before attempting to walk. As a consensus the panel questioned the aims of the program, others who have preceded them, and warned about going too fast.

In response to this Southern stated that he has a great deal of personal faith in the program, but another forceful factor in his support for the program is the belief that time is of the essence in the development of underdeveloped nations, and we must work now in order to take advantage of opportunities as they develop.

Don Paarlberg inquired as to the implications of the words "high population" in this area of the world. In the Philippines Robertson opined that the problem was one of migration of population from one part of the Islands to another rather than the total level of population. Martin stated that both India and Pakistan recognize the problem, and in India some attempts have been made to reduce birth rates. The problem is more difficult in Pakistan because of religious mores. Also at the present time

birth control is too costly for the masses. It may eventually be possible to increase food production more rapidly than population increases. Wells observed that the culture of the country is an important factor in this problem and the lead toward its solution must come from within the country rather than by outside technical aid. There seemed to be general agreement from the panel on this.

F. L. Garlock asked if hoarding of wealth were a problem in getting production started. Is it a lack of desire to invest or lack of suitable investment opportunities? Creek replied that when opportunities exist, some investment does take place. Cooperatives were being used with some success to get capital from landlords into productive plant. Martin observed that factors of both custom and politics were important. Custom is changing with the rise of an entrepreneurial class who will both create investment opportunities and invest themselves. Also there is investment by the wealthy if they are assured that the government will not appropriate it later. As assurance of and faith in political stability grows, there undoubtedly will be more investment by the wealthy. Bratton noted that in the Philippines land was a symbol of status so saving and hoards went into land holding. Now some holding of assets is flowing from land into industry.

James Hanly inquired about the repercussions on Japan and Great Britain if the present underdeveloped countries industrialize and spoil the export markets for Japanese and British industry. Martin indicated that Japan and Great Britain had recognized this problem and were changing the composition of their exports from consumer goods to producer goods or capital goods. Wells noted that the greatest international trade has occurred among industrial nations so increased trade should develop as industrialization takes place in Southeast Asia. Woodin observed that perhaps in fact the underdeveloped countries might proceed slowly in their industrialization. In the case of Formosa sugar is the most important export crop and earner of foreign exchange. The government would think twice before shifting away from sugar to domestic production of industrial goods if this seriously cut their capacity to earn foreign exchange.

Joe Motheral commented that he was astonished that neither of the two spokesmen for the Philippines mentioned land reform in their remarks about technical aid in that country. Broadly conceived, land reform is the paramount objective of the joint U. S.-Philippines program. The goal is highlighted in every official document bearing on the joint program from the Quirino-Foster agreement and the Bell Mission Report down to the most recently activities of the Magsaysay Administration and those of the present ICA Mission in Manila.

Land reform must comprise the heart of any effective effort to estab-

lish democratic government in the Philippines. And it must precede or accompany the effort to raise production levels. The *tao,* or peasant, proved after World War II that he would no longer tolerate his feudalistic status when he used armed force to threaten a government that would not recognize the basis of his discontent. He was placated and the insurrection was put down by official promises to remedy the ancient evils of his tenure system. These promises are being fulfilled under the present administration. The Communist-supported Hukbalahap movement is dead. It will remain dead so long as simple justice prevails in the distribution of rights in land and in the produce of the land.

As for increasing production, this never can be achieved unless the incentive to produce exists for the cultivator. Incentive is precisely what is lacking under a feudalistic system for, between the crop-sharing arrangement and money-lending practices of landlords, the system is so rigged as to assure keeping the tenant at a subsistence level *regardless of how much he produces.* More than any other single factor, the emphasis on production in China, without reference to institutional adjustment, paved the way for the loss to the Communists of that vast territory. Whether the U. S. learned anything from that experience or not, the Filipinos are aware of it and have no intention of duplicating the blunder.

Motheral said he once asked a high-ranking Filipino official to what extent the defeat of the Huks in the Philippines was a military triumph and to what extent it was an ideological victory. The official replied that about 10 percent of the government's success in the operation was military in character and 90 percent of it was purely ideological where the principal ideological weapon was defined as the sincere promise of land reform. If a person is looking for a "key log" in the jam of problems blocking democratic political stability, he need search no further than the reformation of intolerable land tenure systems.

Then Motheral asked the question—Is the assumption of the U. S. extension service on a farmer's voluntary self-help a realistic one for transplanting into other cultures, customs, and traditions? Is the U. S. extension methods philosophy appropriate? Woodin replied by saying that the U. S. way was not appropriate for Japan or Formosa at the present time. A dictatorial but paternalistic top-down type of extension program works there. However he expressed faith that the U. S. type extension system was best for the long pull and that a more democratic extension system could come to these countries later. Southern noted that U. S. extension methods could not handle all the problems found in these countries. Martin concluded by observing that present extension methods seem to work for many production problems and by expressing belief that the voluntary approach is best for the long pull and in fact is slowly developing.

A final question by W. E. Hamilton referred to whether or not and how one knows the United States is getting its money's worth out of technical assistance to foreign agriculture.

Moderator Wells concluded the discussion by saying that the United States is trying to create a community of free nations. In this the United States has differed from the Japanese, the Dutch, the French, and the British efforts overseas. We are not colonizers, rather we want a community of free nations, each standing on its own feet. This is our major weapon against the Soviet or Communist system and its "satellite" system. With this objective as a major part of our basic foreign policy, furthermore, an affective appeal can be made to taxpayers to support technical assistance abroad.

AREA SECTION C. PROBLEMS IN LOW-POPULATION, LOW-TECHNOLOGY, LOW-INCOME COUNTRIES (AFRICA, LATIN AMERICA, THE MIDDLE EAST)

Moderator: R. W. Jones, International Cooperation Administration
Rapporteurs: Montague Yudelman, The Rockefeller Foundation
H. G. Hamilton, University of Florida

Panel Members: W. O. Jones, Stanford University
R. W. Roskelley, Utah State College
Arthur Shultis, University of California
L. W. Witt, Michigan State University
Montague Yudelman, The Rockefeller Foundation

Introduction

The panel discussion was general in nature. Much of the discussion pertained to problems of agricultural development and technical assistance in Latin America, the Middle East and, to a lesser extent, in Africa, but very little of it was oriented specifically toward problems in low-population, low-technology, low-income areas as contrasted to problems in other high-population, low-technology areas. Consequently, most of the problems discussed related to general issues affecting agricultural development and technical assistance in almost all of the underdeveloped areas of the world. Because of this, there was very little in the way of a unifying thread throughout the discussion; possibly this lack of consistency was, in part, due to the method used by the panel members, who began their discussions by each speaker talking briefly on a specific subject that seemed to be important in technical assistance work as it developed in countries that were best known by the participants. The opening statements (which took up most of the panel's time) ranged from the importance of agriculture to the need for keeping technical assistance experts happy in the field.

In view of the diversity of subjects discussed, it has been concluded that the most appropriate method of reporting on the discussion is the descriptive form used below, rather than to attempt to present any detailed analysis of the central problems which emerged from the discussion.

The Discussion

The moderator opened the discussion by pointing out that technical assistance is most complex, requiring an understanding of and dealing with social, physical and economic matters country by country. A major problem is identification of the kind of assistance that will be of most value to the country and the development of the means by which it can be rendered. He concurred with Dr. Mosher's paper opening the discus-

sion in that the U.S. role in technical assistance is not an accident but rather has evolved out of a particular complex of political and economic factors and has a firm foundation in American values. After this brief statement he introduced the panel members and called on each to state his experience with economic development and technical assistance programs and to initiate the more general discussion by speaking briefly on some specific aspects of agricultural development and technical assistance.

The first speaker, Dr. W. O. Jones, stressed the importance of agriculture to the economies of Latin America and Africa: agriculture is important both as the major employer in the economies and also as the greatest contributor to the national output. Consequently, almost anything done to help agriculture is bound to help the economy as a whole. However, accelerated development would most certainly lead to problems arising from some strain being placed on the capacity of underdeveloped areas to produce both their own foodstuffs and raw materials needed by industry. Changing patterns of development, such as shifts from subsistence agriculture to commercial style production, coinciding with some urban industrial development would raise issues in the field of competing demands for labor. This is already happening in some parts of Africa, particularly in the Belgian Congo. Therefore looking ahead, if agricultural production is to be increased, urban industrial demands will have to be countered, in part, by giving rural producers greater incentives to produce. In this context, the whole problem of state expropriation, state marketing boards and other popular devices for handling agricultural surpluses, such as the cocoa board of the Gold Coast, needs some reexamination, particularly if proffered technical assistance is aimed at increasing export crops.

Other general problems that require some attention are those that relate to improving existing agricultural patterns rather than inducing exotic forms of agriculture. There has long been a widespread notion that "all is bad" in indigenous, apparently wasteful, agriculture. Experience, however, has indicated that this is not so. After fifty years of effort, the administration of the Belgian Congo has decided to foster controlled, shifting cultivation, rather than replace it with European forms of production. Thus, today the technical assistance experts are trying to evolve a new type of agricultural system, more suited to local conditions than ever before. Although technical assistance experts need to introduce new concepts and technologies, the resilience of the old systems should never be overlooked.

The second panelist, Dr. R. W. Roskelley, centered his discussion on problems of providing technical assistance to countries where there is very little in the way of institutions through which such assistance might be channeled so as to promote local development. This problem is a seri-

ous one in many parts of the Middle East and in general was a difficult one for technical assistance programs to handle, as most programs are not designed to create institutions but rather to foster local growth by strengthening existing institutions. Experience in Iran, however, indicated that it was absolutely essential to embark on institutional development if any lasting successes were to be experienced from the technical assistance work undertaken there. In this regard, the complexity of agricultural development work in integrating agriculture into national development plans should be cited. U.S. technicians, whose main task is to assist governments with over-all planning, should not be surprised to find that although there might be planning commissions, boards, etc., there are very seldom any institutional organs whereby such commissions might put plans into action, and where such organs do exist, they do so in name alone. For instance, in many countries there are no research programs or research stations, or any extension services to transmit to farmers the results of experiments, and very seldom are there any "grass roots" organizations through which technicians might work.

This problem of lack of institutions poses the question as to where such programs should begin—whether they should concentrate on strengthening such fields as research and making universities effective, or whether there should be field programs that concentrate on increasing production *per se*. Frequently external circumstances dictate which policy should be followed, e.g., food shortage due to bad weather calls for an "impact program" to give quick results rather than to permit the desired longer-term institutional development. Furthermore, in many of these underdeveloped areas, it should never be forgotten that agricultural development often requires coincidental development of other institutions; for instance, development of communications is often an essential precursor, or requires simultaneous development, if agricultural development is to be a success.

The speaker who followed was Dr. L. W. Witt. He first pointed out that countries of Latin America, unlike those just reviewed, have been influenced by U.S. thinking. They have many of the same institutions. The elite people are anxious for technical assistance because they are interested in economic growth. An important problem of economic growth is, of course, formation of capital, but many parts of South America are undergoing conflicts between desire for short-term satisfactions and long-term capital needs. In this regard, a technical assistance program of increasing productivity—so as to promote development ahead of inflation—becomes one of some importance. However, capital formation without inflation requires sacrifices in the form of countries, and persons in the countries, foregoing certain types of consumption and also making wise investments that might only produce long-run benefits. In general, the lower the income the greater the sacrifices of short-term benefits in build-

ing long-term capital. Furthermore, a problem connected with capital formation is that in many of the countries in Latin America the biggest incomes are concentrated in a few hands, and in their efforts to promote development, technical assistance programs frequently have to assist the large landowners so that they may be in a position to use their capital as efficiently as possible. Benefits from such assistance are slow to reach low income people. Thus, there is often a conflict in interests, in that U.S. technical assistance personnel have to support a system that—although it encourages greater productivity—still leaves income concentrated in a few hands, and thus runs counter to U.S. notions on general welfare. However, the fact remains that increased production is a major objective. If we are to be realistic, production can be increased most quickly by assistance to the large farmers.

Mr. Arthur Shultis, the next speaker, talked briefly about his views on technical assistance in Chile and raised some general questions relating to improving the quality and number of national technicians. Chile, in Shultis' opinion, is well developed and has a high plane of living, but is still very short of trained personnel for extension and research work. Once the country has an adequate supply of good agricultural technicians, then the pace of development should accelerate and should proceed along several lines. The country has the institutions for training and for research work, and perhaps the best help that the U.S. can give in agriculture is to facilitate and assist in the sound training of agricultural technicians. In general, the people in Chile are receptive, appreciative of technical assistance, but one of the factors that hampers U.S. technical assistance from becoming fully effective is the lack of continuity in national programming and policy. There is a positive need for some form of committee to evolve a long-term country program to insure follow-up—both on the U.S. and the Chilean side—of the efforts that have already been made in Chile. In the field itself, there is the ever-pressing problem of getting good interpreters and the everlasting battle against bureaucratic procedures. A little more sympathetic understanding from Washington would go a long way to smooth out some of the problems of technical assistance personnel. These problems very frequently hinder the work of the technicians in that much time is wasted clearing trivial matters—not to mention the aggravation that is caused by these issues.

The next panelist, Dr. M. Yudelman, commented on the necessity of technical assistance programs taking into account the different value systems in many parts of Africa, the Middle East, and Latin America. A good understanding of the cultural background of the people in these areas would often forestall serious errors or else provide for aiding development along easier routes than might otherwise be the case. An instance in point is that of neglecting the importance of the cattle culture in parts of Africa. One technical assistance program had concentrated

on improving cattle production in a certain area of Africa, and technicians worked very diligently to eradicate cattle disease in this area. This program was eminently successful, the disease was virtually eradicated and the numbers of livestock increased very rapidly. But the program failed to take into account the fact that Africans consider the ownership of cattle a high prestige factor. Consequently, increased production did not mean increased sale of cattle, but rather, over-grazing, soil erosion, and other contingent problems. If the technical assistance mission had appreciated the cultural value of cattle, they would have undoubtedly had a more comprehensive program that would have taken care of increased holdings in cattle, by developing rotational grazing programs, a system of auctions with price premiums, and so forth, to take the increase into account. In some areas of Latin America, the prestige value for the large landowners in holding land, despite obvious economic reasons for them to act otherwise, might suggest that future development in these countries would be more along the English tenure patterns, rather than the American family-sized farm system. This is not to dispute the virtue of the family farm system, but merely to suggest that this cultural factor associated with land holding in parts of Latin America would seem to favor a system whereby tenants rather than small landowners would become the users of the land presently held by large landowners, provided the present land-holding pattern is not disturbed and provided there are no changes in attitude by the landowners regarding their working their presently unused lands.

In the ensuing general discussion, a wide range of topics was covered. One of the first of these was the question of the economic motivation of persons in underdeveloped areas. The question was raised as to whether or not persons of different cultures are motivated by the same factors as are, say, persons in the U.S.A. Dr. W. O. Jones believed that fundamentally this motivation is the same all over the world, and in reality, economic motivation can be equated with any attempt to acquire scarce goods and services. Thus, frequently actions that seem hard to understand are economic responses to a particular situation. For instance, on the Gold Coast, manioc, a two-year root crop, is often left unharvested. This apparent neglect of a good crop has puzzled outsiders. However, the reason for this is simple: Manioc is very cheap to plant and to grow, but relatively expensive to harvest, and it is only when the expense of harvesting is justified that the producers do indeed harvest it. In point of fact, this is the same motivation that governs the actions of the highly sophisticated Salinas lettuce growers! Dr. Jones insisted that it is not an uneconomic desire to own cows with crooked horns—we need to know why persons attach values to crooked horns.

An exchange developed from the floor and around the table about the issues already raised regarding land and land distribution. Professor

John D. Black pointed out that research had not established if the peasants of India are better or worse off as a result of breaking up of some large estates. However, if it should be established that Indian peasants are better off because of the breaking up of estates, it does not follow that the same thing would be desirable in Latin America. Mr. A. Shultis pointed out that countries such as Chile do not have the problem of population pressure—therefore they can farm more extensively, and in this context, they can have large-sized units of production with beneficial rotations, and in general concentrate on improving management rather than anything else. Several members of the audience commented on the conflict of welfare versus efficiency in the problem of helping the large landowner. One participant from the Middle East suggested that the need for the increase of production, which in turn implies working with the large landowner rather than with the small peasant (because improved technology and a better combination of factors could little benefit the peasant), might indeed be sowing the seeds of failure for technical assistance programs as a whole. The discussant felt that it is more important that technical assistance work toward a concept of "working with the people" and improving their welfare—even though this means sacrificing efficiency in production—than merely concentrate on utilizing resources more economically.

Another speaker from the floor raised the question of the applicability of using the tax as a device for promoting development and evening out income disparities in Latin American areas. The discussant felt that since California had been a Spanish colony, the tax experience that had developed in California might well serve as a guide for the development of the Spanish-American republics. Although Dr. Yudelman and others agreed to the virtue of a notion such as this, they pointed out that the politicial and social environment of many of the countries in Latin America is such that taxation laws such as the one proposed would have very little opportunity of coming into effect, and where such laws were introduced, they would merely remain dead laws on the statute books. But from the floor came the observation that Denmark, at one time a country of large landowners, is now a country of small farms. Also from the floor came this observation: status quo will not remain—either landowners increase their advantage or it must be decreased through duress. In this connection, Roskelley points out, is the fear of the landowners, the elite, who frequently are worried as to how this assistance is to affect them. They should be apprised of the consequence of change, but frequently they have not been informed of the possible results of technical assistance programs. A question was raised as to whether or not it is necessary for the underdeveloped areas to change their cultural patterns so as to be able to utilize technical assistance more effectively. The moderator was most emphatic that this, in a sense, would defeat the goa

of technical assistance—which is not to make people over in the U.S. image but rather to help them develop along their own selected patterns. On the question of cultural change, Dr. W. O. Jones pointed out that the mere presence of the technical assistance expert in the foreign country does in a sense introduce some change in that country—wittingly or otherwise. The expert brings new ideas and new patterns of living into these areas, and invariably some change must result—no matter how small. Mr. Shultis would like for change to come about in these countries as it does in the U.S., recognizing, however, that there is some conflict between efficiency and welfare. There was lack of agreement on whether aid should be in the nature of changing cultural patterns or whether it should be done within existing cultures.

A speaker from Latin America raised the question of the conflict of interest between technical assistance programs and surplus disposal programs. He wondered whether technical assistance programs are being specifically developed to avoid adding to world surpluses or whether they are designed to promote national development irrespective of the consequences in the surplus picture. There was some discussion about the case of Peruvian cotton. However, the moderator pointed out that it is established ICA policy not to assist directly cooperating countries to increase production that results in adding to the world surpluses, as it is felt that such programs merely compound existing problems and do very little to solve national problems of economic development. Mr. Shultis pointed out that while the U.S. government could not enter into technical assistance programs that encourage production of commodities already in surplus, there was nothing to prevent the foundations, such as the Rockefeller Foundation, from doing this kind of thing—in fact, with regard to some food grains, the Rockefeller Foundation had promoted their domestic production to the great benefit of various Latin American countries.

Conclusion

It was a pity that the panelists did not have more time to devote to such problems as *how* U.S. technical assistance might be used more effectively and in what directions future technical assistance might be steered. Also, more analysis of the results of technical assistance programs —in terms of impact on national economies—would have been welcome. Some stress on the differentiation in approach needed to deal with, say, Indian and Libyan problems, would have been appreciated. Surely there must be a greater emphasis on the need to increase yields in some areas as opposed to increasing production by extending acreage in others. Time did not permit examination of panel members' thoughts about capital intensive and labor intensive approaches in some countries, in contrast with less intensive approaches in others.

EFFECTIVE COOPERATION WITH AGRICULTURAL ECONOMISTS ABROAD

Committee Report*

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THE committee on "Effective Cooperation With Agricultural Economists Aboard" recognizes numerous mutually advantageous reasons for such cooperation. An effort to be of service to present and future agricultural economists in other countries is a two-directional need. Insofar as foreign students and visitors seek training at our institutions, there is a major need to prepare our own teachers to render a greater service through securing a better understanding of conditions and needs in other countries. The teacher can learn from his students as well as from foreign assignments and contacts. Agricultural problems and the use of resources are quite different in different countries. The subject of agricultural economics is given little place or is just beginning to be recognized as an essential part of educational and governmental activity in some parts of any country and—in too many instances—in entire countries.

The mimeographed report presented to members of the AFEA entitled, "What Have Land-Grant Colleges Been Doing to Improve Agriculture in Foreign Countries," presented by C. L. Stewart and M. G. Smith under date of December 29, 1952, gave proof that instructional work designed to help students interested in agriculture in foreign countries was in no sense standardized, although 24 of 45 colleges responding to a questionnaire offered "regular courses that have dealt in some degree with foreign agriculture."

One senses, in the statements prepared by men who have spent a year or longer teaching in a foreign country, that they are in some degree critical of their own colleagues who are in need of "tolerance and understanding in their thoughts and actions" in instructing foreign students. Numerous suggestions were made that those who are expected to teach foreign students or instruct regarding foreign agricultural problems be given more contact with problems as they occur in other countries. Many students from foreign countries come from the homes of the well-to-do, and too often from a city environment that has given them little

* The committee, in presenting this progress report, wishes to acknowledge responses to its questionnaire from about 30 men, many of which included additional carefully prepared statements.

or no opportunity to know the agriculture or the farm people of their homeland. Such students, although they wish to improve the standard of living of farm people, need to learn the problems of the people they would serve. Although most of our agricultural workers, even at the top level of our educational system, are farm reared, this has been the exception in many countries where education tends to be centralized in cities.

Foreign students in particular strive too hard to attain a Ph.D. degree. It should be part of an orientation program to appraise a student's previous training and to plan a program that will supplement this training. A.B. or B.S. degrees at different institutions, even in the same country, do not denote the same attainment. Many times it might be better to recommend adapted advanced undergraduate courses in place of those strictly at the graduate level, and usually there is need for some general agricultural training. For the future work some foreign students will do, a Master's degree, properly constituted and supplemented with advanced undergraduate training, may have more value to them than a Ph.D. degree heavily loaded with prescribed courses and the general academic attainments required of Ph.D. candidates. A student who has mastered two languages may have little actual need of doubling that number to be a useful citizen. He had better spend more time in learning to interpret the problems of his own locale and the methods of communicating effectively with the farm people of his homeland.

Summary of Questionnaire

The following section summarizes the responses from the questionnaire sent to departments of agricultural economics and a few others.

1. *What Suggestions Do You Propose Regarding Basic Training Programs for Foreign Students In Agricultural Economics?*

A number emphasized the need for instructors to attune our teaching to conditions that the student knows. Instructors who had had foreign experience generally agreed that we should emphasize instruction in principles and methodology, including statistical training, but that one weakness, partly because of the limitations of our instructors, lay in not applying the instruction to practical problems with which the student was acquainted. The following specific suggestions were offered:

A. Students known to be short in their preparation, because of the wide variation in training offered by different countries, should be required to take advanced undergraduate courses for a semester or longer to be sure their basic training is adequate before letting them pass on to graduate training. Responses from several foreign graduate students emphasize that they were not well informed before coming to the United

States regarding the character of work that would be required of them, and that they needed a detailed description of the training we require in statistics, economic theory, and the basic agricultural subjects before completing undergraduate preparation.

B. Foreign students should not predominate in any class. One man commented that five or six foreign students majoring in agricultural economics were as many as should be handled within one department. If larger numbers of foreign students are to be accommodated, a staff might be developed to handle them, but in general classes should not be made up entirely of foreign students.

C. Insofar as possible, the instruction should be tailored to fit the needs of individual students. This might be done by assigning more problems for students to report on in seminars. One reason for doing this is that we need to be especially careful, when teaching principles, to show their application to economic problems.

2. *How Can Instructional Work Be Made More Practical and Effective?*

Foreign students have difficulty in understanding what we teach. Economic phrases, unless they are simply expressed, may be altogether new to them. We should not expose students to much material that might have limited application to their conditions. One of the repeated suggestions was to properly orient students before they undertake graduate study. Along with this suggestion was the comment that more care needed to be given to selecting mature men of real promise for graduate training.

Descriptive theses that are merely a recital of conditions in a foreign country should not be accepted, but students should be required to present a thesis that is a scientific study. Well qualified and well supervised foreign students might, however, secure research data at home before undertaking graduate study, to use as a basis for writing their theses.

3. *What Can We Do to Overcome Such Handicaps As the Instructor's Unfamiliarity with Foreign Areas?*

Institutions undertaking to train foreign students should have on their staffs men who have had extended experience abroad. Perhaps more members of the staff should use their sabbatical leaves for foreign assignments. Teacher exchange programs should be thoroughly tried out and expanded. Men with foreign experience should be used in staff seminars.

Some emphasized that staff members who leave their home institutions for this work should not be overburdened with research and other responsibilities upon their return. Their foreign experience should be recognized and they should be given the opportunity to work with foreign students at their own institutions. One person suggested that any department with five or more foreign students should have an additional pro-

fessor on the staff whose job would be to help these students understand the application of principles taught through demonstrations on farms.

4. *Can New Graduate Students from Foreign Countries be Better Oriented Before Undertaking Study?*

Without exception the answers to this question were affirmative, but the suggested means were somewhat diverse. The need for foreign students to master the English language was repeated many times. More attention needs to be given to undergraduate preparation and training in order to adapt the work to the student's needs. We need to acquaint foreign students with American institutions and the economic organization of our country and give them an understanding of the attitudes and motives of our people.

We need to select mature students with the proper aptitudes. One interesting suggestion was that some of their own countrymen who had had experience in the United States might provide some basic orientation for foreign students at home before they come here.

5. *Can Heads of Departments of Agricultural Economics Profitably Discuss the Training of Foreign Students?*

All respondents favored a discussion among department heads, or others whom the department heads would designate, to take the major responsibility in working with foreign students. It was emphasized that institutions attempting to train foreign students should have someone on the staff whose major responsibility is to supervise and associate with these students. One suggestion that might have merit was that we bring the foreign students together in the summer sometime during their training, and preferably near the close. At this time they might be given the opportunity to put into practical application some of the theoretical principles they had been taught.

6. *Should the AFEA Arrange Sectional Programs to Discuss the Training of Foreign Students?*

Except for two replies, the answer was yes. The two exceptions suggested that, after the report of this committee and the 1956 AFEA program, we might be in a better position to decide what the AFEA might undertake to do.

7. *What Should be the Objectives, Through the Exchange of Students on an International Basis and the Promotion of the International Conference of Agricultural Economists, of Quickening the Interest of Maturing Staff Members and Developing A Better Appreciation of World Agricultural Problems and Methods of Solving Them?*

The exchange of mature students on an international basis might be an excellent means of finding future leaders who would prepare themselves by advanced training and possibly devote their lives to international work of the technical assistance type.

Several persons, including at least two who had attended the recent International Conference of Agricultural Economists, emphasized its value to them and urged that attendance be encouraged. The International Conference period is too short to give staff members a thorough understanding of conditions in other countries; but especially those who have had some foreign experience can gain a great deal from a conference held in a country with which they have not previously become acquainted. In brief, the International Conference of Agricultural Economists should be looked upon as filling the place in international relations that the AFEA fills within this country.

8. *How Can a Better Understanding be Obtained Regarding the Research Problems of Greatest Significance in a Given Country?*

Some of those who have had foreign experience suggest that an experienced team representing the plant, animal, and social science fields might well spend a period of six months or more in appraising the situation in company with native authorities. This seems to fit in with the general plan now being used by land-grant institutions giving technical assistance in a foreign area. An institution that makes such a study will probably be one of the best places for students from that country to study. We should of course not overlook certain information available through the technical assistance programs or the intercollegiate exchange programs of the ICA, the Colombo plan, and the experience of such foundations as Ford, Rockefeller, the Council on Economic and Cultural Affairs, and the Asia Foundation. Some of the conferences, such as the School for Southeastern Asia Studies, also promise to provide much help along this line.

9. *What Can be Done in the Way of Furnishing or Exchanging Library Materials Between Countries?*

Some answers to this question deserve careful consideration. It does no good, for example, to send material indiscriminately to a library; it should be carefully selected. Perhaps this is a phase of work that might be undertaken by foundations that can adequately supervise the project.

10. *What Can the AFEA Do to Aid the Situation?*

The purpose of this committee was undoubtedly to determine what the AFEA could do to help solve the problems set forth. Some questions were

listed under this heading to get ideas both about what the AFEA should or should not do.

A. *Supply copies of the Journal of Farm Economics to key institutions.* In general, it was felt that this publication would have a place in most of the leading foreign institutions, but that the association should not be expected to furnish free copies. It should be valuable to the top personnel but would have limited value for students. Perhaps much of the current material alone, without the historical background furnished by earlier issues, might even give some wrong impressions on what constitutes an agricultural economics program. Attention needs to be given to the progressive development of our present-day programs in this field.

B. *Develop a plan to help supply subject-matter materials to institutions in special need of assistance.* Most of the replies indicated that this point should receive attention. Perhaps the *Journal of Agrarian Affairs* might serve this purpose, but it was not certain that it could do all that needed to be done. Do we know enough about the needs of other institutions? Possibly a committee of the AFEA could assist in this field and might even serve as a clearing house. Some of the foundations that are dealing with conditions in other countries might be in the best position to handle this matter, but not all of them have personnel in the field of agricultural economics. The International Conference of Agricultural Economists may be a good avenue of approach. This problem needs further study.

C. *Have a standing committee report to the association on international problems pertaining to the field of agricultural economics in general, with special reference to instruction and research.* It was suggested that the report of such a committee should be exposed to the criticisms of a wider group than would be possible at one meeting. Certainly those institutions that are now helping to train foreign students could profit by having a standing committee give attention to these problems, especially by bringing together the experience of a number of institutions.

D. *Seek and publicize examples of good research in foreign countries.* It is always well to know of real research accomplishments in our own field. Perhaps the question should be who is going to define what is good under certain given conditions. It might be well to have the *Journal of Farm Economics* cite, from time to time, the types of study that are being carried on to advantage in various countries.

Some foreign research workers have reason to feel chagrined that their work receives so little recognition by our agricultural economists. It is a common complaint of agricultural economists that they have difficulty in keeping up with new research, especially when it is not published in

their own language. We can advance the cause of good agricultural economic research by giving it recognition. As one respondent commented, it is accomplished research under familiar natural and economic conditions that sets the pace of progress in any country.

E. *In areas where agricultural economic work is seriously underdeveloped, study the priority of need for adapted courses and phases of research in agricultural economics.* The replies indicated very definitely that it would be desirable for institutions in this country to know more about such needs. Can the AFEA accomplish this purpose, or should we work with various agencies to learn their experience? Guidelines must be given by people working in the various countries. Survey teams may already have done much of this sort of thing. The AFEA might bring this material together and circulate it to members who are interested. Instead of emphasizing the priority of courses, it might be more important to emphasize the content of desirable courses.

F. *What can be done to provide text and reading materials in the native language to areas lacking adequate material?* In general, those who had been abroad seemed to agree that this was a definite problem in many countries and that texts needed to be better adapted. In some countries a further interest in the field of agricultural economics cannot be expected to develop rapidly until more subject matter is available in the local language.

G. *Find out how association or committee effort can be used to help plan improved approaches to these problems, including securing the financing necessary to accomplish specific projects.*

The general suggestion is that through a committee the AFEA can work with both individuals and private agencies to give helpful service. Undoubtedly it can act best as a liaison group, and it may want to make known to selected agencies its willingness to give such service.

Orientation of Students

In replying to the questionnaire, Dr. J. Lossing Buck, who is associated with the Council on Economic and Cultural Affairs, and who since graduation from college has been engaged in some phase of education in the Far East, has prepared an outline dealing with the orientation and training of foreign students that should command the careful thought of all who have any responsibility in this field. No effort is made to summarize this outline here because it is available on request.

The responses indicate that many problems center around proper orientation of both students and teachers. Adequate orientation should include:

1. Determining the educational level of the student.
2. Helping him to adjust to conditions under which instruction is offered.
3. Giving the student a proper introduction to the pattern of training designed for him.
4. Fitting the instruction to situations known to the student.

This plan assumes that the teacher has had foreign experience, that he has a sincere desire to serve his fellowman, and that he has a strong bent for fitting theory and principles to practice.

Although it should be possible for a number of departments of agricultural economics to develop an international approach to agricultural economics with an adequate graduate program, not many will have the financial means or the personnel to give the comprehensive training and close supervision needed in such a program. At the same time, no institution has a monopoly on the kind of instruction that is needed.

Some phases of such a program, including orientation at both the start and the close, before the student sets out for the field he is to serve, might well be provided by an international and an inter-university staff. Qualified by experience, training, and a desire to give the needed service, this staff might be situated at a few institutions, located either in the United States or abroad. Perhaps this closing phase, which might be described as orienting students to return to their home countries, could be handled as a summer session for students who have taken work at a number of institutions. It should be offered at a site that provides varied types of farming to allow a range in demonstrating farm production and marketing problems. This program would be a suitable undertaking for some adequately financed foundation.

As part of the complete picture, the ICAE should help to recharge the enthusiasm of agricultural economic workers on a world basis in the rapidly expanding program of agricultural economic teaching, research, and extension. After close association of students from many countries during college days, some common bond such as the International Conference of Agricultural Economists should prove desirable later on an international basis, just as the AFEA provides such a bond on a national basis.

No one knows all the answers to the questions the committee posed for itself and leaders of the AFEA. Experience is rapidly accumulating however through the help that many of the land-grant institutions are giving to foreign institutions and governments and through the programs of TCA, the FAO, the Council on Economic and Cultural Affairs, the Ford and Rockefeller Foundations, the Asia Foundation, and many other

organizations. It is important that this experience be coordinated in a way that will insure the proper instruction of students who will be the future leaders in the field of agricultural economics. There should be easy access to knowledge of the facilities that have made possible the best we have in rural development to serve as a guide in developing better rural living under diverse conditions elsewhere in the world.

GROWING DEMAND FOR WATER: PRODUCT AND COST ALLOCATION

Chairman: O. L. Brough, Jr., State College of Washington

THEORETICAL CONSIDERATIONS OF WATER ALLOCATION AMONG COMPETING USES AND USERS*

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THE use of water, increasingly strategic to national, regional, state and community economic development, is afflicted with many confusions, uncertainties and conflicts. These difficulties are bursting into the public limelight with increasing tempo in the form of Hell's Canyon, Central Valley, Dixon-Yates and related controversies. However, the basic problems run much deeper and permeate the entire fabric of water use. These problems arise from the rapidly increasing demands for water and are characterized by the necessity of making decisions of allocating limited amounts of water among competing uses and competing users.

The purpose of this paper is to explore relevant economic considerations in allocating water among uses and users and thereby to lessen the conflicts, uncertainties and confusions of water use through the application of economic principles. This purpose is approached through the following six sections. First, the nature of water demands and supplies are examined. Second, the process of making decisions on water allocation is considered. Third, the determination of amounts of water for individual uses is probed. Fourth and fifth, economic criteria for water allocation among uses and users are examined. Finally, choice indicators for allocation purposes are examined.

In proceeding through these several sections, no attempt has been made to analyze any particular program or policy of water allocation. However, examples of programs and policies are used for purposes of illustration and communicating economic ideas. On the other hand, the economic considerations explored in the succeeding sections should prove useful in developing and carrying out specific investgiations at an applied level of research.

Nature of Water Demands and Supplies

Until recently people in the humid parts of the United States, and to a

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lesser extent in the more arid areas, have taken water supplies for granted with air and sunlight as unlimited gifts of nature. In recent years, however, people residing in humid as well as in arid parts of the nation are becoming increasingly concerned about availability of water in carrying on their economic activities. People throughout the entire nation are gradually becoming cognizant that water can become a scarce resource and that steps must be taken to economize on the use of water in many competing uses and areas. Since 1950, four presidential commissions have dealt extensively with water resource problems from national and regional viewpoints.[1] States are taking a fresh look at their water problems through legislative study committees and state resource agencies of research and policy formulation.

Increasing demands upon available water supplies are unmistakable. These demands are growing at an increasing rate stemming (1) from our rapidly growing population increasing 1.7 percent each year and (2) from our increasing per capita use of water which is about twice as rapid as our rate of population growth. Thus, our aggregate demands for water appear to be increasing as much as 5 percent each year. This means a doubling of our total demand for water each 20 years. Over the next 25 years, the total estimated increase of domestic, industrial and agricultural uses of water may be up as much as 140 to 150 percent.[2] This increase represents additional demands for water equal to 145 New York cities. It would require the total flow of 11 Colorado Rivers.

Uses of water may be divided into two categories, (1) consumption uses and (2) production uses. Consumption uses representing a direct demand, include domestic, recreational and other uses wherein water in used directly by the consumer. Production uses representing a derived demand, include uses such as power, navigation, air conditioning and manufacturing, wherein water is engaged in the provision of products and services apart from the water itself.

This classification of water uses appears helpful in analyzing the allocation of water among users as will be treated later in the inquiry. For the present, however, it is simply noted that consumption uses vital to human life and well-being, are generally given a higher preference rating and usually are difficult to express in monetary terms. Little attempt is made to place cardinal values on these several uses; only ordinal values are used on behalf of the community.

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[1] The President's Water Resources Policy Commission; The President's Materials Policy Commission; The President's Missouri Basin Survey Commission; and Commission on Organization of the Executive Branch of the Government.

[2] For a more detailed statement on the increasing demand for water, see *Report on Natural Resources and Power*, Vol. 1. Commission on Organization of the Executive Branch of the Government. U. S. Govt. Printing Office, Washington, D.C. 1955. pp. 3 ff.

Both consumption and production uses may be subdivided into (1) exhaustive uses and (2) nonexhaustive uses. Exhaustive uses such as home consumption, preclude any further or other use being made of the water. Nonexhaustive uses such as navigation or air conditioning, do not necessarily preclude other uses being made of the same water. Nonexhaustive uses may be further subdivided into (a) existential nonexhaustive and (b) potential nonexhaustive. Existential nonexhaustive uses such as swimming (consumptive) and waterpower (productive) do not preclude other uses being made, although other uses may be curtailed in the process as soon as water has been committed to one nonexhaustive use. Potential nonexhaustive uses may be modified to permit other uses being made. An example is water used for air conditioning where the water is disposed of through sewers, thus severely restricting further use. The water could be returned to the underground aquafer from whence it was extracted, however, or it could be put to other uses since the temperature change is the only character affected.

Specific relationships among these various uses may be competitive, neutral or complementary in nature. Complementary relationships between two uses result in achieving more net benefits from each use and hence do not constitute a problem of allocation among uses. Likewise, neutral relationships whereby neither use has any effect (either inhibiting or expanding) on net benefits of the other use is not involved in allocation. Thus, the allocation problem is chiefly concerned with competitive uses, that is, wherein one use restricts the net benefits to be derived from a given amount of water in another use. Or, from the viewpoint of users, competitive relationships exist when one user restricts the net benefits of another user and hence the total benefits may be curtailed from a given amount of water devoted to a particular use.

Let us now turn our attention briefly to the characteristics of the supply of water.[3] The report of the President's Water Resources Policy Commission takes the position that "while use of water is increasing and there are areas of of deficient water supply for present and future needs, the

[3] Certain fundamental characteristics of our water supply affecting its use become obvious. First, water is a migratory resource in the surface, sub-surface and supra-surface phases of its occurrence. This means that water moves across property lines. This also means that the use of water at one point in space affects the amount and quality of water available for uses at other points. Second, water is a flow resource, to the degree of annual moisturefall. The portion that is unused proceeds through the hydrologic cycle. Third, subsurface or surface reservoirs of trapped water provide a fund resource which may be depleted or maintained depending upon the rate of drain similar to other fund resources. Fourth, unused water may be stored through structural and cultural impediments. These characteristics are physical in nature. Their consideration in making water use decisions depends upon the economic and institutional characteristics.

overall situation reveals an adequate available supply for the Nation's needs";[4] current uses of surface water, for example, are estimated to include only one-fifth of the total runoff of our streams and rivers. Similar estimates of uses of ground water are not available for the Nation. However, it appears obvious that the total physical supply of water both present and potential is far greater than present or foreseeable demands. The possibilities of weather modification and reduction of sea water to productive and consumptive uses, may add materially to the physical supplies of water in the not too distant future.

Actually, the use of natural resources, including water, may be regarded as a function of man's knowledge. Through increasing knowledge of his natural environment, man is continually transforming the resources with which he comes in contact, in satisfying his wants.[5] At any given stage of knowledge, a wide range of physical possibilities presents itself. This range of physical possibilities undergoes continuous expansion through technological discoveries and inventions. Man's choice of particular physical possibilities is motivated by his wants and achievement of particular want satisfactions. At any particular time, man's choice of particular physical possibilities as means toward achieving want-satisfactions is limited by rules of conduct among men governing their behavior in resource use. These rules of conduct sometimes characterized as "institutions" either inhibit or facilitate both the choice of means and the implementation of means for satisfying human wants. More will be said about this idea later in the inquiry.

Thus, it appears that the problem of water supply is not the inadequacy of physical amounts of water but rather the problem of what portion of the physical supply is to be used, what uses are to be made of it, the geographic distribution and what means are to be used in making water available for consumptive and productive uses. The transportation of water from the Colorado River to California is an example of converting a segment of the physical supply into economic uses. The diversion of water through the Great Divide from the West to the East slope of the Rockies through the means of the Big Thompson project is another example. The construction of large storage reservoirs, the use of weather modification and the conversion and transportation of sea water to useful purposes and sites of use, respectively, are other possibilities. Thus, scarcity of water is relative—relative to the price people are willing to pay in relation to other goods and services they desire.

[4] *A Water Policy for the American People*, Vol. I. President's Water Resources Policy Commission. Government Printing Office, Washington, D.C. 1950, p. 120

[5] A similar view of natural resources is developed in Ervin Long, "Freedom and Security as Policy Objectives," *Journal of Farm Economics*, Vol. 25, p. 317, 1953.

The Decision-Making Process of Allocation

The process of bringing supplies of and demands for water into juxtaposition involves making important decisions affecting the development and use of water resources. Many decision-making units may be involved, ranging from the private firm to the national public through a continuum of in between private, public and quasi-public decision makers. In the process of decision making, three closely interrelated facets may be distinguished. First, is the objective (s) to be achieved. Second, are the practices or policies (means) available for achieving the desired objectives. Third, are the consequences of the several alternative means (practices or policies) in terms of the achievement of the stated objectives.

Insofar as decision makers and their constituents are interested in maximizing the net product of water and other resources, economics provides guides and criteria for evaluating various alternative legal and technological means for accomplishing the objective.

Thus, from a public viewpoint, the maximization of long-run social benefit from the use of water resources may appropriately represent a public objective of water use. This is true insofar as people prefer more to less of the goods and services obtainable from the use of water and other resources. To the extent that this is a public objective, economic criteria may guide physical and legal measures for affecting water use. Historically, this process has been the reverse. Physical means of control have been initiated or laws have been passed or court decisions have been rendered that either prohibit or are not consistent with the most efficient use of water resource. Not only has the economic product of states, the nation, regions and communities thereby been curtailed, but economic inefficiency has generated considerable conflict and litigation both within and among decision-making units.

Within the process of decision making, economic elements or water problems come to the forefront at two closely related levels of allocative decisions. The first involves decisions among competitive uses. The second involves decisions among competitive users. In the former category, decisions must be made concerning the amount of the physical supply of water that is to be made available for use. Of the available supply, decisions must be made between and among consumptive and productive uses. In the latter category, which is closely allied with the first, decisions must be made on how the available water is to be allocated among competing users. Will this allocation be channeled through public or private development? What will be the rules whereby public and/or private users acquire, maintain and alienate rights of use?[6]

[6] Water allocations among uses and users are being made constantly. Some of these allocations are based upon precedents and historical accidents. Some of the

Economic theory has much to contribute to the resolution of these problems. The next three sections are focused upon three major considerations involving how much water may be used economically in particular uses, allocation of a given amount of water among competing uses and allocating a given amount of water among users engaged in a particular use.

Determining Amount of Water for Individual Uses

An initial problem in use allocation of water involves determination of the amount of water that can be used economically at a particular time and place for each competing use.[7] From such an analyses of all competing uses, the aggregate demand for water may be estimated and allocations may be made among competing uses and users.[8] It should be noted that consumption uses often compete directly with production uses.

Water use cannot be isolated from use of other resources that are technical complements. Water is rapidly becoming a scarce resource, giving rise to economic decisions in its use; but equally important are decisions relative to the use of labor and capital which are also scarce resources. At this point, such questions as these arise: Will society gain more from a Big Thompson Project or will the resources used for this project return more to society if used for increasing school facilities or in constructing cross-country highways?

Figure 1 illustrates the amount of water (assuming that the supply is not limited) that may be used for a particular use in relation to the costs and value product involved. The total cost of various amounts of water is shown on the X axis; the total value of product resulting from use of the various amounts of water in a particular use (Use I) is shown on the Y axis. The linear outlay curve for water used is represented by OA while the total value of products from Use I is represented by BF. Three points

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precedents were useful when first initiated but are no longer applicable in light of changing demand and supply conditions. Other water allocations stem from gadgets developed to serve a particular purpose that is not oriented in the maximization of total net benefits to be derived from water. The "Basin account," "interest component" and "unity benefit-cost ratios" are examples.

[7] At this point, recognition should be made of the fact that water may yield detrimental as well as beneficial consequences. To diminish a detrimental use, may add as much to economic welfare as to extend a beneficial use. However, the minimization of detrimental uses should not necessarily have priority over maximization of beneficial uses. Chiefly, public concern is with use of water to help maximize economic welfare of society in total. This requires getting the proper balance between (a) lessening of detrimental uses and (b) increasing beneficial uses. The gain either from lessening a detrimental use and from extending a beneficial use must be measured against the cost.

[8] This and succeeding sections do not deal specifically with multiple purpose uses of water. Allotted space necessitates this limitation. However, the ideas presented are basic to a consideration to multiple purpose uses and may be extended to encompass them.

in this possible scale of use are shown on Total Value Product curve BF. C is the point at which the ratio of increase in total value product to increase in total outlay is greatest. Point D is the use of water at which the gross value product exceeds outlay by the maximum amount. Point E is the use of water at which the gross value product equals the total outlay.

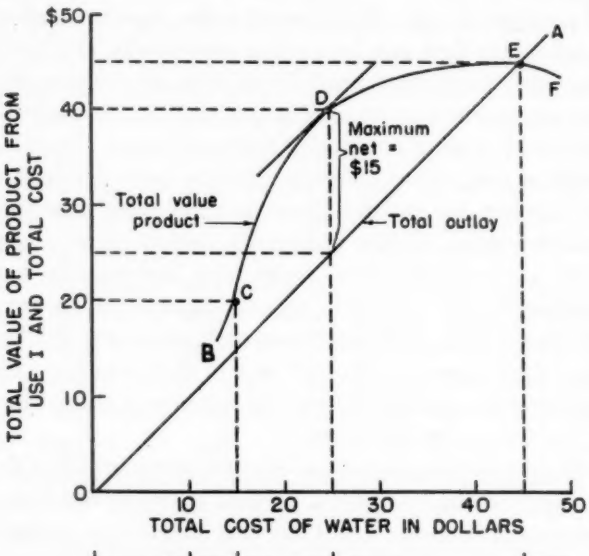

FIGURE 1. PRODUCTIVE VALUE OF WATER IN USE I RELATED TO COST OF USE.

If the use of water were terminated at point C, the rate of value product accrual per unit of outlay would be at a maximum but the full economic possibilities of water in Use I would not be realized since additional segments of water could be used for which value product would exceed the outlay involved. At point D, the added outlay for the last increment of value product is just equal to the added value product resulting from this increment of outlay. At this point, $25 of total outlay would result in $40 of total value product. The total value product exceeds the total outlay by a maximum of $15. Extension of outlay beyond this point would involve increments of outlay in excess of the value product added by such increments. This extension is not economically justifiable.

Although the ratio of total value product to total outlay is unity or more between points D and E, the increments of value product resulting from the corresponding increments of outlay are increasingly less than

the outlay for these respective increments of value product. Hence, the extension of use of water beyond point D is not economically justified.[9] These increments of water (beyond point D) should be either diverted to another use or left unused.

From this illustration a basic principle of marginal analysis may be restated as follows: the amount of water allocated to a particular use should be extended to the point where marginal outlay (cost) equals marginal value product (revenue). Through the application of this principle to each of the many competing uses of water, an aggregate demand may be approximated for water use. Such estimates would, of course, change with the price per unit of product produced and the cost of units of water used. Thus, the application of the principle would embrace changes in consumer demand from the price side as well as changes in technology from the supply side. Such changes can readily be accommodated in the model presented.

Allocation of Water Among Uses

Attention now turns from the amount of water that can be economically absorbed in one use (Use I on Figure 1) to the allocation of a given amount of water among several competing uses. Figure 2-A provides a conceptual illustration of this problem and the possible solution. The underlying assumptions in this model are (1) a given supply of water and (2) two alternative competing uses for the given supply.[10] For purposes of presenting the idea, only two competing uses are shown. Of course, numerous alternative uses may be competing for the use of a given supply of water.

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[9] This principle of water use has been violated frequently in water development projects through the unity benefit cost-ratio criterion.

[10] In presenting the economic considerations in allocating water among uses and users, the following two major conditions are necessary; (1) the legal and physical means should provide reasonable certainty in the use of water and distribution of its benefits and (2) the flexibilities in water use rules must be present in order to meet changing preferences of society. For example, water may have been used for irrigation of a crop that consumers no longer desire. Hence, irrigation priorities should not be retained, if a new industrial product, using water for fabrication, is now more highly desired by consumers. Private investment in use or control of water, even where given high social priority, will be curtailed if the continuous possibility of extreme change in legislation exists; or if the consequences of legal and physical actions are highly uncertain. On the surface, at least, there is an apparent conflict between these two conditions, with respect to law. Jerome Frank in his *Law and the Modern Mind,* New York, Tudor Publishing Co. 1935, contends that "much of the uncertainty of law is not an unfortunate accident; it is of immense social value." p. 7. Frank relates what may be considered as uncertainty of law and the flexibility that law must possess in order to accommodate changing conditions. For a further discussion of this point, see John F. Timmons, "Integration of Law and Economics in Analyzing Agricultural Land Use Problems," *Journal of Farm Economics,* Vol. XXXVII, No. 5, December 1955, pp. 1134 ff.

The budgeting curve AE shows all possible allocations to two uses of a given supply of water.[11] The entire supply of water could be placed in Use I. This extreme allocation of the given water supply to Use I would be represented by point A. Another alternative allocation would be point E, wherein use of the entire water supply would be allocated to Use II. Besides these extreme allocations of water, many possible combinations

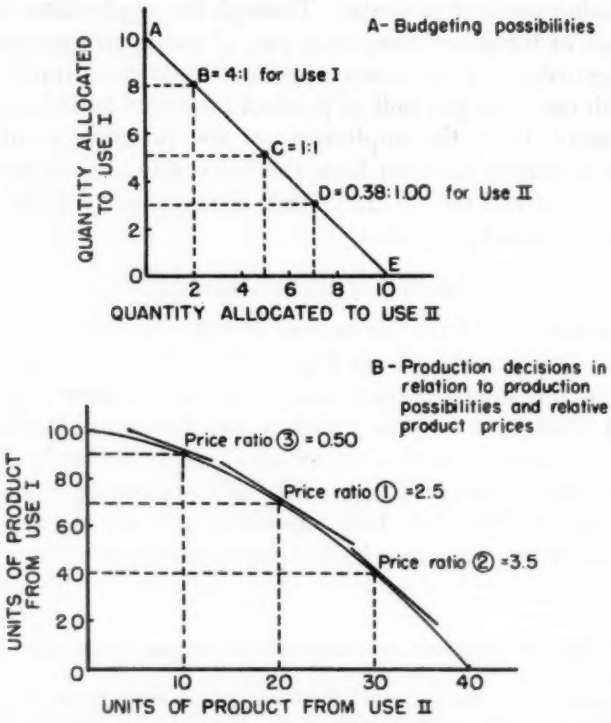

FIGURE 2. HYPOTHETICAL ALLOCATIONS OF A GIVEN SUPPLY OF WATER BETWEEN COMPETING USES.

of uses could be selected. For example, we could produce much of Use I and little of Use II, as at a point B; much of Use II and Little of Use I, as at a point D; half of Use I and half of Use II, as at C; or any other of the many combinations along the budgeting curve AE. But which one of these many alternative combinations is the optimum?

The answer cannot be given until we are able to place values on the

[11] If the supply were twice as great, the production possibility curve would be twice as high; with a water supply of only 50 percent, the production possibility curve would be only half as high; hence, the need for establishing the supply, and then the total of production possibilities or alternative uses.

products. The selection of alternative uses should be in terms of a flexible choice criterion reflecting the changing desires of people. The choice criterion normally employed in specifying how resources should be used is the pricing mechanism.[12] Profit is at a maximum if the rate of substitution among products (resource uses) is equal to the product price ratio. That is, the substitution or sacrifice ratio among production possibilities must be equal to the price ratio, the choice criterion applied by the society of consumers.

This principle is illustrated in Figure 2-B. Suppose that from a given supply of one resource (such as water), or a given supply of a bundle of resources (such as water, capital and labor), the following combination of products can be produced; all of commodity (or service) I and none of II; 90 of I and 10 of II; 70 of I and 20 of II, etc. as illustrated in Figure 2-B. The production possibility curve presents the sacrificial relationships. For example, a change from a combination of 100 of I and none of II, to 90 of I and 10 of II, we sacrifice one unit of the former for each one unit gain in the latter. Under a third combination, wherein 70 of I and 20 of II are produced, two units of I are lost for each one of II gained. Under a fourth combination, 40 of I and 30 of II are produced resulting in a gain of one unit of II for each 3 units of I given up. Generally, increased diversion of water for one use entails increasing sacrifices in other uses to the degree that water is scarce in relation to total demand.

Now suppose the consuming society says that it wishes both products I and II; but that it places a price on the product of Use II that is 2.5 times the price of the product from Use I. (Figure 2-B). This price ratio, a price for product II that is 2.5 times the price of product I, is the choice criterion, the expression of relative importance by the consuming society that serves to indicate the optimum use of resources. The firm producing the product can increase profits by extending Use II at the expense of Use I as long as the substitution ratio of Use II for Use I (i.e. the amount of Use I sacrificed to gain one more unit of Use II) is less than the price ratio, expressed in terms of the quotient of price of Use II divided by price of Use I.

Hence, since the substitution or sacrifice ratio, between the first two combinations of uses, is only one, and is less than the price ratio of 2.5, the second combination is preferable to the first. (Figure 2-B). The third

[12] Through the relative prices that consumers are willing to pay for products, consumers reflect the relative importance they attach to each. Given these prices, firms, whether they be farms, industrial businesses or community enterprises, produce commodities and services in line with consumer preferences, if they select combinations of products in line with these prices. By in line with, is meant a combination of products (resource uses) that will maximize profits of the firm or enterprise.

combination (70 of I and 20 of II) also is preferable to the second since the substitution ratio of 2.0, in going between the second and third combinations, is still less than the price ration of 2.5. However, the fourth combination is not preferable to the third; since the relative amount of I sacrificed to gain one more unit of II, is more than proportional to the greater weight placed on Use II by consumers.[13]

Hence, a general principle has been indicated for attainment of our first major condition. It is necessary to determine the production possibilities in the use of water and determine the rate at which one use must be sacrificed to allow attainment of another use. Then, these production possibilities and sacrifice (or substitution) ratios must be related to the relative importance that consumers attach to the different uses.

Thus, economic logic can demonstrate that such precedents as appropriation and riparian doctrines cannot be taken as the sole basis for allocation. The appropriation doctrine would say that the choice of alternatives should be in terms of the use made by the first person who puts the water to beneficial use. This procedure might, for example, result in selection of point A; Use I alone which might be irrigation of potates. This single use would continue, on the basis of the appropriation doctrine, even though consumers preferred more of Use II, which might be industrial products, and fewer potatoes. Water laws that result in such a choice among alternatives would hinder attainment of maximum economic welfare. Similarly, use of the riparian doctrine also could result in a suboptimum selection of uses. This doctrine, specifying that the owner of land adjoining a water course has the right of water for any natural beneficial use he selects, might result in the selection of point E in Figure 2-A whereas society might actually attain the greatest economic welfare by some combination of uses such as points D or C, for example as illustrated in Figures 2-B and 2-A.

Allocation of Water Among Users

The preceding considerations concerned with allocating water among uses lays the basic foundations for allocating water among users. For there must be a user(s) associated with each use and the water allocated to each use would suggest the allocation among users also.

There are, however, some additional considerations that apply to allocation among users. These considerations stem partly, at least, from

[13] If consumer preferences changes so that Use II has 3.5 times as much value to them as Use I, the optimum combination then becomes 40 of I and 30 of II (i.e. with prices of $3.50 for II and $1 for I). (Figure 2-B). Or, if preferences change to include a price of $1.20 for I and $.60 for II, a price ratio of .5, the optimum combination is 90 of I and 10 of II, since the substitution ratio, in going from the first to second combination, is greater than price ratio of .5, the relative importance placed on the product of Use II as compared to Use I.

the kinds of uses made of water. As pointed out earlier, one class of uses may be termed consumption uses wherein water is used directly by the consumer as a want-satisfying good or service in and by itself. Examples are drinking and bathing uses of water. Obviously, people want a per capita distribution of these uses. Some people should not die of thirst or even forego bathing for bodily welfare purposes, while other people use limited water to wash cars. The high ordinal importance of water for drinking purposes is sufficient for governmental units (city govenments, for example) to decree other uses be curtailed or banned in assuring a sufficient supply of water for domestic uses. Hypothetically, it would be possible to start with the nation's region's, state's or community's water resource and allow one or a few persons or firms to harness its productive potential and realize the income therefrom, while other persons gained not at all. But obviously the satisfactions derived from the last dollar of water-generated income to the person receiving one million such dollars likely would be less than for the person with only five such dollars.

Hence, legislation, administration and physical measures must recognize the user allocation problem as well as the water use allocation problem, if the nation or any region is to have the most effective use of water. Care must be exercised that the means allowing attainment of one of these major conditions (i.e. allocation among users) does not unduly interfere with attainment of the other (i.e. allocation among uses). For example, it might be possible to attain equity in the distribution of water among users by decreeing that each person in the nation annually have the services (i.e. an amount of water) equal to 1/168 millionth of the supply. However, some of the persons would have only unproductive uses of the water while the same water would have a greater marginal value productivity if added to the share of another person and purpose. Hence, absolute equality in the distribution of water would interfere with efficiency in the allocation of water in production. But are there not possible alternatives that would allow efficiency in production allocation and equity in distribution? The answer is likely, Yes. For example, it might be possible to put a price on water in line with the supply and productive uses. Those industries and firms that could pay the highest price for water (i.e. have uses with the highest marginal value productivities in line with consumer demands) would gain its use. Of course, certain prior uses, apart from the pricing aspects, for human consumption and recreation for example, might have to be established first.

Let us turn our attention to the manner in which water may be allocated among competing users. Figure 3 is a hypothetical illustration of such an allocation. A might have a production function of AA′ and B might have BB′. By inverting B's production function over A's (and in

using the same scale of water used in relation to product realized) the point of tangency of the two functions or X, provides the basis for making an allocation between A and B. At point X, the marginal value product of water used by A equals the marginal value product of water used by B.

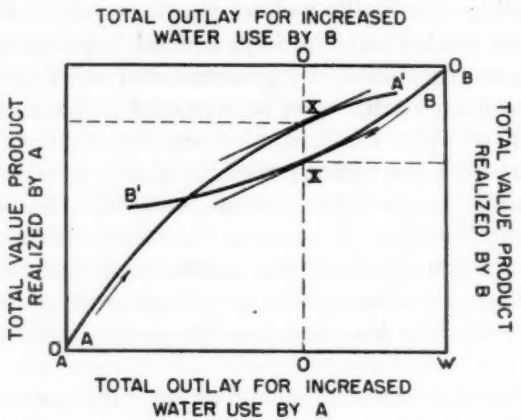

FIGURE 3. HYPOTHETICAL ALLOCATION OF A GIVEN QUANTITY OF WATER BETWEEN USERS PROVIDING PARTICULAR GOODS OR SERVICES.

Thus, of the total supply of water available, or AW, A would receive AO amount and B would receive OW amount.

Choice Indicators for Allocation Purposes

In numerous instances, the pricing mechanism can be used as the choice criterion reflecting the wish of consumers back to users of resources. Prices can be used conveniently in allocating water uses within a single firm, and sometimes between firms. For example, the farmer using irrigation water may well divert it from corn to alfalfa, if consumers cause the price of the first to be depressed and the price of the second to be inflated. Or, an industrial firm using water to manufacture one product may "giveway" to a firm producing an entirely different product, if society refused to buy the former but places a price and quantity premium on the latter. However, for many uses of water, the pricing system cannot be used as a choice-indicating mechanism. The citizens in the lower part of a watershed have no effective means of expressing, through the pricing mechanism, to farmers in the upper reaches of the watershed the relative value they attach to water uses (i.e. flood control). There is but little opportunity for the pricing mechanism to be used in diverting water from irrigation or power production to recreation purposes. Therefore, other preference indicators must be sought.

Just because the pricing mechanism is inadequate for allocating certain water uses, its use as a choice criterion should not be discarded. Instead, other means must be found for measuring and reflecting the relative value of water in its different uses as either a supplement to or substitute for the price indicator. Another allocative indicator is the voting mechanism whereby people directly or through their elected representatives vote for particular uses of water.[14] Also, consumer preference studies may be used to indicate preferences for various uses of water. These relative values attached to particular uses can then be compared to the production possibilities of water, and a choice of uses may be made in line with these two phenomena. Ordinarily, optimum choices will be effected with some combination of price (e.g. as in letting the farmer select in allocating water between two crops) and legal (e.g. as in priority for household over industrial uses) mechanisms.

In many instances, ordering of priority in use may be relatively simple. For example, water use for human consumption undoubtedly has highest priority. Similarly, control of water to spare human lives in flood has high priority. Beyond these points, however, ordering of uses is not so clear cut, and must involve much more study. For products move into the market, the rule should be; use water for the purpose that has the highest marginal value product. If each unit of water were allocated in terms of its marginal value product, a maximum addition to the social product would be guaranteed in water use.

The application of this principle with its various manifestations, involves ex-ante analysis of future uses. What is important is not so much the estimate of water productivity at this moment in time; but the prediction of what its value productivity will be 25 or more years from now. When income per person increases, consumer preference patterns change, and resources should be used accordingly. Will the current farm surplus continue, with a consequent low value premium on use of water for food products as compared to industrial products? Will population increase, and consumer tastes stabilize, to a point where 25 years hence the need for more food will place a greater premium on water than industrial uses? These economic questions must be answered at the time allocative commitments are made, if water is to be allocated most efficiently among uses and users.

The application of the ideas presented in this paper involves many and difficult problems of estimation. These problems include the estimation of future demands for water in various uses and the supplies available

[14] Of course, the voting mechanism for expressing preferences among uses may be considered as an application of the pricing mechanism if the voters expect to pay part of the cost of the goods and services produced.

for satisfying these estimated demands. The value product of water in terms of cardinal or ordinal values, in various competing uses, remains to be determined although we are not without useful information on these values. Likewise, estimates of costs of providing water under different alternative technoligical means, remain to be made, although, here too, fragmentary data of useful nature are available. The theoretical considerations presented help specify the nature of data needed for allocating water among uses and users. Obtaining, ordering and analyzing these data continue to offer a challenging and fruitful field of research in economics.

CAN WATER BE ALLOCATED BY COMPETITIVE PRICES?[1]

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Introduction

"CAN water be allocated by competitive prices?" If the answer to this question were simply yes, the American people would have established a well-defined market for water long ago. The fact that such a market does not exist suggests that determining the price of water competitively presents economic and/or institutional problems that have not yet been resolved.

In this paper an effort is made (1) to establish a conceptual framework for evaluating the economic status of water, (2) to describe an economic environment that would facilitate the competitive pricing of facilities that make water useful, and (3) to suggest the extent to which it may be possible to use competitive prices to allocate the cost of water-producing facilities.

The Economic Status of Water

The economic status of water depends upon how the word is defined. Technically, water is the liquid form of the chemical compound H_2O. The word water is also used to describe a wide variety of aqueous solutions and suspensions. The differences among these definitions is in the amount and/or kind of substances dissolved or suspended in the solution. In this analysis all solutions and suspensions comprised of a relatively high proportion of water including sea water are identified as water resources.

Water resources cover roughly two-thirds of the earth's surface to an average depth of several thousand feet. Furthermore, the supply of these resources is not changing appreciably with use. Thus, the world's supply of water is sufficiently large to permit the approximately 2.5 billion people that inhabit the earth to use it freely. As long as water resources are free goods, there is no need for society to establish a system of competitive prices to allocate their use.

In the natural state most water resources will not satisfy human wants directly. To make these resources more useful it is necessary to alter their quality characteristics, transport them and store them. The phrase, "quality characteristics" is used throughout this paper rather than the word "purity" because the amount and/or kind of substances dissolved or suspended in water determines its usefulness rather than the absence of any

[1] Florida Agricultural Experiment Station Journal Series No. 514.

such substances. In other words, quality,[2] time, and place utility must be added to water resources without altering the chemical structure of water.[3] Consequently, it is entirely appropriate for society to be concerned about the economic status of facilities that create utility in water resources.

Together with an adequate supply of water resources, the human race inherited the hydrologic cycle—a gigantic facility that employs the sun's energy to create utility in water. In the sense that the hydrologic cycle creates utility in water without being consumed itself, it is a capital good—a capital good that is a free good as long as the amount of water of specified quality characteristics is available during a given interval of time in a specific location exceeds the capacity of the cycle to produce those utilities. Actually, the hydrologic cycle became a scarce good at certain times and in specific locations very early in the history of civilization. Since then, people have been endeavoring to increase the utility of water by augmenting and/or expanding the cycle by constructing such things as wells, reservoirs, conduits, etc.

Since it is the capital facilities used to make water useful that are scarce rather than water resources per se, society is really confronted with the question, "Can the cost of erecting the capital resources to create utility in water be allocated by competitive prices?" The answer to this question depends on the objectives of public policy and kind of economic environment that is established to attain them.

Public Water Policy

In the formulation of public water policy to create a given amount of utility in water, two of the most important factors considered are: (1) the efficiency with which capital water facilities are constructed and operated, and (2) the extent to which the initiative and enterprise of private firms and individuals can be used to accomplish this. In a few instances these two objectives can be attained simultaneously by approximating the assumptions of a purely competitive economic environment. Generally speaking, however, Americans have chosen to establish the most efficient facilities to produce utility in water and alter the purely competitive economic environment to make use of them. Policies adopted to date have resulted in the establishment of a wide variety of social institutions that add utility to water—all of which lie between the two extremes (1) of

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[2] Quality, or quality characteristics, is the type of form utility that is unique to water.

[3] In some instances it is desirable to make hydrogen and oxygen from water but the volume of water decomposed is not a significant portion of the aggregate supply of water.

private firms operating a purely competitive economic environment and (2) of enterprises publicly owned and operated.

Such requisites of a purely competitive economic environment (1) as perfect knowledge of market conditions, (2) as freedom to enter or withdraw from the market, (3) as independence of buyers and sellers, and (4) as freedom from governmental actions that restrain trade, could be rather easily created in a market for the right to use water. On the other hand (1) water rights have not been defined with sufficient precision to facilitate trade in all of them and (2) some of the facilities that produce utility in water cannot be operated efficiently by a large number of firms. For these reasons democratic societies have not used a purely competitive economic environment to evaluate the right to use water extensively.

Property Rights in Water

As long as water resources are free goods, the only reason society finds it desirable to establish property rights in water is to allocate the use (1) of scarce portions on the hydrologic cycle and/or (2) of other capital facilities that create utility in water resources. Once established, water rights become commodities that can be traded in a competitive economic environment. To the extent society has defined property in water, it has made it possible to evaluate some of the facilities that make water resources more useful competitively. Because society has failed to identify and define property rights in all uses of water with sufficient precision to facilitate trade the value of many facilities that produce utilility in water cannot be determined in the market place in capitalistic economies. Society finds this task of defining water rights unusally difficult (1) because utility in water is highly perishable and (2) because it is extremely difficult to prohibit those who do not own some kinds of property right in water from using it.

Utility in water is a highly perishable good (1) because the time and place utility of specific volumes of water is constantly changing and (2) because water is capable of dissolving and/or holding in suspension a wide variety of substances. Since these characteristics also rank high among those that make water satisfy a large variety of human wants, practical definitions of water rights must be spelled out in terms of specific volumes of water that can be used within definite periods of time at specified locations and the range within which quality characteristics can be altered.

The riparian doctrine of water rights fails to meet these criteria of specificity largely because it does not distinguish between the rights to use land and/or water with sufficient precision to facilitate trade in the water right. Likewise the doctrine of prior appropriation fails to specify

water rights with sufficient precision to insure the maximum utilization of water in many instances because adequate provisions are not made for using the water both before and after it is used for the purpose for which it was appropriated. Furthermore, neither doctrine provides a satisfactory means of identifying all of the consumers of utility in water. The nature of these limitations on the usefulness of both of these doctrines strongly suggests that it will be necessary to develop a new and more comprehensive concept of water rights—a concept that will identify and describe the right to use water for all purposes rather than for part of them. Only when this is done will it be possible to make more extensive use of competitive pricing to allocate the use of capital water facilities.

The Number of Firms Producing Utility in Water

The number of firms that can effectively compete with each other for the privilege of earning a profit by producing utility in water varies (1) with the number of people that live at specific geographic locations and (2) with the nature of their wants and desires for utility in water. In some instances a single firm can supply a single type of utility in water to many buyers living in close proximity to each other more effectively than to two or more. In other instances it is possible to produce two or more kinds of utility in water more economically than separate firms produce single utilities. On the other hand, there are instances in which numerous firms can compete with each other in producing the same kind of utility in water. Consequently, it is unrealistic to envision making all of the components of the potential market for water rights competitive in the same way or at the same time. Instead, the possibility of making each of several major segments of this potential market competitive in terms of these requisites should be evaluated separately.

Competitive Characteristics of Segments of a Potential Water Rights Market

Adjustments of quality characteristics

Ocean water is taken from storage and all soluble substances removed in the evaporation phase of the hydrologic cycle. The capacity of this phase of the cycle to produce fresh water is probably still ample to supply the aggregate of human wants in all instances in which it is economically feasible to add appropriate time and place utility. As long as this is true there is no need to consider the extreme case of how to allocate the use of the evaporation phase of the cycle by competitive pricing.

The fact that it is not always economically feasible to add time and place utility to fresh water and that time and place utility in water are frequently scarce goods has stimulated much research designed to reduce

the cost of purifying sea water below the cost of adding time and place utility to fresh water. If and when this research is successful it is entirely possible that the price of purifying saline solutions can be established competitively, especially along the sea coasts where many entrepreneurs can have access to free water resources, can deliver pure water to those who purchase the right to use it, and can prohibit others from using it.

It is also possible to create utility by adjusting the quality characteristics of fresh water by removal (a) of the salts that are dissolved as water moves over and through the earth's surface and (b) of man-made pollution.

When the quality characteristics of water are altered in the production of a consumer good the costs making this alteration are included in the cost of production and allocated among the users by competitive prices to the same extent that competitive pricing is used to allocate that good among consumers. On the other hand, when the quality characteristics of water are adjusted for domestic use by public agencies or private firms holding franchises, the price of these utilities is almost always determined administratively because the number of firms needed to simulate a competitive economic environment cannot produce efficiently.

Fresh water is frequently used to facilitate waste disposal. Unfortunately, not all public agencies and industrial firms that use water for this purpose reconstitute the quality characteristics in it. Thus, one user destroys the utility of other potential users. When property rights can be defined precisely, it will be possible to establish the value of facilities for removing waste from water by competitive pricing. Furthermore, in an increasing number of instances the value of the products removed in the process of adjusting the quality characteristics of water are sufficiently valuable to induce firms to recover them and in doing so create utility in water as a by-product. When this is done, the cost of reconstituting the quality characteristics of water is allocated in exactly the same manner as the cost of the products removed.

On the other hand, there are numerous instances in which water is used as a conveyer of waste because other potential users are not able to enter a competitive market for this utility in water. To date, the most effective means of retaining quality characteristics in water is to enact laws prohibiting pollution or contamination. Prohibition of water pollution is clearly implied in the riparian doctrine and to a lesser extent in the doctrine of prior appropriation. However, this concept has not been translated into law with sufficient clarity for the courts to enforce it.

Transportation

By moving water vapor through the atmosphere the hydrologic cycle creates place utility in water. Rights to the use of the atmosphere have not yet been defined with enough precision to price this phase of the

cycle competitively. If and when it becomes desirable to augment the capacity of the cycle to move water in the vapor phase it may largely be accomplished with such facilities as pipe lines, conduits, etc.—facilities that lend themselves to evaluation by competitive pricing more readily than the vapor phase of the hydrologic cycle.

Once water vapor is condensed, gravity moves the liquid on and through the earth's surface. Society's efforts to define property rights in the place utility of water moving along the earth's surface takes the form of the riparian and prior appropriation doctrines. The extent to which the riparian doctrine facilitates the competitive pricing of the right to use water is limited (1) by the inclusion of water rights in the bundle of rights that comprise the fee title rather than the establishment of a right that can be traded separately, (2) by differences in he quality characteristics of water rights at different times and locations, and (3) by rights of the government. In the few instances in which the riparian doctrine does define water rights that can be easily traded, the value of the rights can be determined competitively only if the number of firms is large enough to preclude the possibility of monopolistic pricing.

The doctrine of prior appropriation defines water rights more precisely than does the riparian doctrine. However, there are numerous instances in which only one or a few individuals or firms can use them effectively. To the extent the owners have monopolistic powers, the requisites of a purely competitive market are not met.

Property rights in the movement of water through the earth are not as well defined as surface water rights. The utility created in this phase of the hydrologic cycle is now scarce in several parts of the United States. In the long run competitive prices can evaluate this phase of the cycle if it facilitates conservation of utility in water. To accomplish this a new concept of property rights in water is needed.

Storage

The water storage capacity of the atmosphere is probably still a free good even though the amount of water available in particular areas of the atmosphere is scarce at certain times. Recent technological developments strongly suggest that it may soon be possible to use the storage capacity of the atmosphere much more fully by stimulating and controlling precipitation.

In the past, the fee title to portions of the earth's surface has allocated to its owner the right to use the vapor-phase storage reservoir of the hydrologic cycle above it. There is no indication that the techniques now being developed for regulating precipitation can be confined to any geographic portion of the atmosphere. A more intensive use of this

phase of the cycle, however, will alter the bundle of rights that comprise fee titles very substantially. To cope with this development society might follow three quite different courses of action, each of which would require a different device for pricing time utility in water. (1) The atmosphere could be held in the public domain and some governmental agency made responsible for regulating precipitation. This would make it necessary to evaluate this component of the cycle by legislative and/or administrative action. (2) The atmosphere could be held in the public domain and the responsibility for regulating precipitation allocated to one or more private firms that would charge land owners for their services. This would facilitate competitive pricing of capital facilities, but if only one firm could precipitate water efficiently the holder of that right would have monopolistic powers—monopolistic powers that society generally controls by regulatory agencies. (3) Private property in the atmosphere could be created and allocated by competitive bidding. This would call for about the same type of pricing mechanism as the previous method.

It would be highly desirable for society to develop a method of evaluating the time utility created by releasing water from the vapor phase as soon as possible in order to minimize the destruction of capital due to inevitable changes in property rights, to facilitate an orderly integration of a new technique into the economic system, and to give the individuals and firms that utilize time utility in water to participate in the determining of its value.

Facilities for storing water in the liquid phase on the earth's surface fall into two groups: saline solution reservoirs and fresh water reservoirs. At present, the utility of saline solution reservoirs is still a free good and hence, there is no reason to use any pricing mechanism to allocate its use. On the other hand, facilities for creating time utility in fresh water reservoirs are so limited that a major effort is being made to extend them. In doing this, society can (1) retain surface water storage facilities and their operation entirely in the public domain, (2) retain the surface water facilities in the public domain and license private firms to operate them under some prescribed public policy, or (3) create private property in the facilities and rely on competitive pricing to stimulate their extension and use. Some of the most controversial problems in public water policy lie in this area. In contrast to the problem of allocating time utility in water stored in the vapor phase, the users of some of the utility created by storing water in the liquid phase can frequently be identified with considerable precision. For example, the users of the time and place utility in water that is converted into electricity are the people who use electricity. On the other hand, it is extremely difficult, if not impossible, to identify the people that use time and place utility in water for scenic

and recreational purposes and then more difficult to charge them for it under existing water law. The only way the use of water in reservoirs and/or streams can be fully evaluated is by administrative and/or legislative pricing.

In contrast to the methods used to allocate the costs of constructing major fresh water storage facilities, the cost of small water storage facilities such as farm ponds are almost entirely allocated by competitive prices. Farmers who are the immediate beneficiary erect these facilities when they are convinced that the benefits will exceed the costs.

The soil also constitutes a fresh water storage reservoir. In some instances, the use that is made of the soil expands its water-holding capacity and in instances reduces it. To the extent that the income received from the sale of farm products provides the incentive for farmers to use soil and water conservation practices, competitive prices are used to allocate this portion of the surface water storage facilities. During the past decade the public has become sufficiently interested in conserving both the soil per se and its water-holding capacity to expend public funds to accomplish this end. In doing this society expressed a preference for administrative prices over competitive pricing to evaluate the water-holding capacity of the soil.

Finally, large quantities of water are held in underground reservoirs. To the extent that the owners of the fee title to land can control the use of these reservoirs they are roughly evaluated by competitive pricing. However, in an increasingly large number of cases, land owners are withdrawing water from underground reservoirs more rapidly than the reservoirs are being recharged. In these instances competitive prices as currently determined, undervalue the use of the facility in the long run. Furthermore, it is possible for one or more land owners to use a larger portion of the underground water storage capacity than the fee title really allocates to him. This suggests that a more precise definition of property rights in underground storages such as unitization as practiced in the oil industry would facilitate the use of competitive pricing of this phase of the hydrologic cycle.

The problem of identifying specific situations in which competitive prices can be used to allocate the use of facilities to create utility in water is further complicated by the fact that it is frequently possible to extend the usefulness of water by creating several kinds of utility in it simultaneously. For example, it is often possible to erect facilities that will produce a combination of quality characteristics, time and place utility in water in an entire watershed. In these instances it is possible to generate electricity, facilitate navigation, provide recreation, and control floods with multi-

purpose facilities that create more utility than facilities designed for one purpose only. In these cases competitive prices can be used to allocate the utility of water among users who can be identified and required to pay for it. However, if only the users of water who can be identified and charged for it are required to pay for all of the utility created by a multipurpose facility, competitive pricing does not allocate the cost of the facilities among all users. Hence, before competitive pricing can be used to allocate the cost of all kinds of utility in water, it will be necessary to expand the definition of property rights to include all rights to use water and develop methods of prohibiting those who do not buy water rights from using water. In other words, merely making private companies responsible for extending the capacity of the hydrologic cycle will contribute little or nothing to allocating the cost of such facilities by competitive pricing as long as the facilities are multipurpose facilities that create utility in water that cannot be traded. Furthermore, to the extent that new water storage and transportation facilities are erected that do not create all of the utility possible from water, including flood control, navigation, recreation, etc., society cannot obtain the fullest benefit from modern technology.

Conclusions

When water resources are defined as being all aqueous solutions with relatively high water content, including sea water, they are free goods. The hydrologic cycle that creates utility in water resources was originally a free capital good. The demand for water with specific quality characteristics at specified places and/or certain times sometimes exceeds the capacity of the cycle to supply it. Thus, portions of the cycle are scarce or economic goods that society is endeavoring to expand and augment with man-made structures and new technology.

The possibility of using competitive prices to allocate utility in water varies in different segments of the cycle. To maximize the use of competitive pricing of the rights to use water it will be necessary to satisfy as many of the requisites of a competitive environment as possible in each and every situation in which such facilities are scarce. In other words, competitive pricing does not constitute a magic formula, the use of which will insure society that the facilities creating utility in water will be evaluated satisfactorily at all locations and at all times.

Whether or not the scarce portions of the hydrologic cycle and the cost of erecting and operating facilities to expand them can be allocated in a more competitive economic environment than prevails at present depends primarily on the ability of human beings to define the rights to use

facilities that produce utility in water resources with sufficient precision to facilitate trade, and on the number of firms that can produce and that can use water rights in specific areas. Hence, the extent to which the use of competition in pricing water rights in the future depends upon the ability of people to alter their social institutions to accommodate a growing population and new technological developments.

ECONOMIC IMPLICATIONS OF THE PARTNERSHIP POLICY IN WATER RESOURCES DEVELOPMENT

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THE resource development policy labelled the "partnership" approach by the Eisenhower administration has been the subject of much discussion. Unfortunately, most of this discussion has been highly emotional in character and closely related to partisan politics. Little attention has been given to the implications of the partnership approach with respect to efficiency in the use of resources, division of benefits and costs among the "partners," the problems of measuring the benefits and costs that are to be allocated, the existing legislative specifications with respect to cost sharing, and the manner in which the various levels of government will participate. The purpose of this paper is to consider these important factors in a policy which emphasizes the joint participation of public and private groups in the development of the nation's resources.

This paper is not concerned with the charges of "natural resources giveaway" hurled at the partnership program on the one hand or the cries of "creeping socialism" regarding large-scale public development of resources on the other. In this discussion I will accept at face value the provisions of the partnership policy as outlined by President Eisenhower in his messages on the state of the union and in the budget to Congress in January of 1955. The important features of the partnership policy are quoted in the President's words as follows:

(1) "I believe that the nation must adhere to three fundamental policies: first, to develop, wisely use, and to conserve basic resources from generation to generation; second, to follow the historic pattern of developing these resources primarily by private citizens under fair provisions of law, including restraints for proper conservation; and third, to treat resource development as a partnership undertaking—a partnership in which the participation of private citizens and state and local government is as necessary as is Federal participation. . . . The Federal Government must shoulder its own partnership obligation by undertaking projects of such complexity in size that their success requires Federal development."

(2) "One of the primary considerations in establishing the partnership power policy has been the need for an adequate supply of power. . . . Here is where our power partnership policy enters. The idea is very simple. It is based on the concept of individual initiative with government cooperation. Because of the large expenditures required to assure that our power needs will be fully met, this department has encouraged state and local public bodies and private organizations to supply their own power needs and to share with the Federal Government in the development of our water resources. Thus, the Federal Government will be in a better position to contribute toward the cost of those

necessary projects which, because of size or complexity, are beyond the capability of state or local groups to finance or which provide benefits of a broad public nature."

(3) "In our concept local groups are those people with legitimate interests in developing the resources of an area. In this term we include: private persons, state and other political subdivisions, public power districts, irrigation districts, public utility districts, corporations, privately-owned public utilities, or other responsible non-Federal groups regional in character. If they are financially capable of developing the natural resources of an area, we are willing to be partners with them or, if able, they should proceed alone. We do insist that projects will proceed in a comprehensive manner to assure maximum development of our resources for multiple uses including power, fish and wildlife, recreation, municipal and industrial water, irrigation and other beneficial uses."

With the above quotations as a point of departure, I propose to consider the partnership policy in relation to the following: (1) multiple use of resources (2) reimbursable and nonreimbursable costs (3) the measurement of benefits and costs (4) the legislative provisions for cost sharing, and (5) resource development by various levels of government.

This paper is something of a pioneering effort. There is little, if any, experience to which one can turn in the way of functioning projects or programs demonstrating the partnership policy in action. In fact, it may be argued that the controversy over the partnership policy has slowed resource development rather than accelerated it. You will recall that acceleration of power development was one of the aims stated by President Eisenhower. On the other hand, resource development had slowed down prior to the proclaiming of the partnership policy because of a growing reluctance on the part of Congress to make the necessarily large appropriations. In any case, it appears that the economic implications of the partnership policy must be analyzed mainly from the standpoint of intent rather than performance.

Multiple Use of Resources

Multiple use of resources has been an important part of public policy for many years, particularly with respect to forest resources. So far as water resources are concerned, the multiple use concept may be said to have fully matured in the quarter of a century since the Hoover Dam was authorized in Boulder Canyon in 1928 as the first federal undertaking of a large-scale project designed to effect multiple purposes on a major river including flood control, navigation, reclamation, and power. More and more, the people of the United States have come to recognize that we are no longer a nation of unlimited resources with the choice of using those resources wastefully or only partially. In the case of water, which is rapidly becoming a scarce resource in many areas, it appears that it will be necessary to make the most complete use possible of the available

supply if we are to fill all of our requirements. This puts extreme emphasis on the possibilities of multiple purposes development.

How does the partnership policy of resource development fit into a program of multiple purpose development and maximum use of our water resources? You will note that President Eisenhower emphasized multiple use. There is considerable evidence, however, that in the practical application of the partnership policy much of the multiple use concept is being ignored or overlooked. In the first place, most of the discussion and action has revolved around hydroelectric power generation. This is true to the extent that the partnership policy appears to be restricted to the power phase of water use and to not be a partnership policy for over-all water resource development at all. This is evidenced in both popular writing and congressional debate wherein emphasis is concentrated on the public vs. private power aspects of specific structures. Indeed, many proponents of the partnership policy talk only of the partnership *power* policy. Seldom, if ever, is there reference to the over-all multiple use aspects of individual structures much less the relationship of that structure and its uses to the comprehensive development of a river and its drainage basin.

It appears to have been characteristic of private power developers to think in terms of "run-of-the-river" dams. Perhaps this is to be expected since the developers of private generating facilities have not been in a position to consider most of the other multiple uses. The structures built in the process of developing private power capacities have contributed in many cases certain nonreimbursable benefits which we now recognize as being legitimate charges against the general public. The traditional emphasis of the private power developers on "run of the river" dams, however, seems to carry over into their current consideration of the partnership policy. There is little evidence that the private power interests give much consideration even today to the relationship between upstream storage and downstream generating facilities and the relationships of both of these to the other multiple uses. In the case of the Hell's Canyon controversy, for example, the discussion has revolved almost entirely around a comparison of the generating capacity of the alternative proposals vs. the construction costs of the alternative proposals. In the few instances where individuals have discussed the relationships of the other benefits and costs to both of the proposals, the general tendency has been to reach a rather quick and arbitrary conclusion that these values would be the same in either case and then to get back to the controversy of public vs. private power development at the earliest possible moment. I am quick to admit that I have made no analysis myself of the Hell's Canyon situation but I am immediately suspicious of a conclusion which says that all of the benefits and costs, with the exception of those related

to the power facilities, are equal for the alternative proposals. I am sure that there must be some differences in the effects the two alternative proposals have on the generating capacity of the series of large-scale dams downstream on the main stem of the Columbia River. It seems reasonable to assume some differences would exist with respect to flood control, navigation, recreation and other public benefits and costs.

It appears necessary that the private partners in the partnership process of resource development give increasing emphasis to the multiple purpose concept of development if we are to achieve maximum use of our resources. This means that the thinking and planning of private developers of our resources must go beyond consideration of the on-site benefits which accrue to any particular structure. Thinking and planning must be in terms of systems of structures as has been emphasized in the case of public development for river systems. Only if this becomes a major consideration in partnership development can the new policy be equal to the old in terms of the benefits realized from the available resources.

Reimbursable vs. Nonreimbursable Costs

As might be expected, the private segment of a partnership development is concerned only with the assumption of costs of a reimbursable nature. The costs associated with the development of various public benefits such as flood control, recreation, fish and wildlife are assumed by the public partner. Thus far the private segment of partnership development has been limited almost entirely to power development which is, of course, the big income producer in any water resource development. Some legislative leaders have objected strenuously to the fact that the partnership type of development results in the private enterprisers developing the profit-making phases of a project while the public assumes all of the non-reimbursable costs. What are the economic implications of this situation?

In theory, the public benefits are paid for by the public out of the general treasury whether the project development is entirely public or whether it is a partnership affair. The persons who object to the private participants in the partnership taking on the profit-making part of the enterprise are suggesting, in effect, that they feel the government should be making a profit on the reimbursable costs and using this indirectly to subsidize the costs of the public benefits. It is doubtful if the people who raise the objection to what they call a one-sided partnership recognize that this is really what they are saying.

A great deal of confusion exists on this point. There is a tendency to carry the profit motive of private enterprise over into public resource development. Many times in the past, the opponents of public development of resources have applied the criteria of private investment to gov-

ernment projects and programs in an attempt to prove they should not be undertaken. Now we find the proponents of public development arguing against the partnership policy on the grounds that the government should participate in the profit-making phases of development.

The government should not be concerned with showing a profit on its natural resources operations but only in reimbursing the treasury for the actual costs. Obviously, if a resource project will produce profits sufficient to attract private capital, private enterprise should undertake the project. In some instances, however, public action may be necessary even where profits are possible. The risk element may be more than private enterprise can absorb. Large projects may be beyond any feasible combination of private effort. Public development may be the only means for projecting sufficiently ahead of current demand.

The confusion over the private profit aspect of public development of resources has caused this writer to ask on a previous occasion if the following can be consistent as goals in resource development: (1) achieving the greatest return per dollar of public money expended, and (2) achieving maximum benefits from particular resource situation.[1] These points are pertinent in considering the relationship of the partnership policy to both multiple purpose development and reimbursable vs. nonreimbursable costs.

Perhaps the controversy over the fact that the private enterpriser in a partnership with the government is concerned only with water uses promising a good rate of return is the result of the emphasis provided by the proponents of the partnership policy. We have noted previously that their viewpoint is best illustrated by the fact that they commonly refer to the partnership *power* policy. Also, the private utilities have demonstrated most of their interest in partnership arrangements in the Columbia Basin with its tremendous power potential. On the other hand, there has been little evidence of interest in the partnership possibilities of the Eisenhower administration program for the Upper Colorado River.

Measurement of Benefits and Costs

Measurement of benefits and costs has received increasing attention in recent years. Development of multiple purpose projects has emphasized the importance of measuring benefits and costs because it is necessary in the end to charge costs against the various users in a multiple-use situation and to relate these costs to the benefits received by the various users. The problem is particularly important in securing proper distribution of costs among public beneficiaries and private users. The problem becomes

[1] Roy E. Huffman, "The Water Resource Problem," *Proceedings of the Conference on Increasing Understanding of Public Problems and Policies, 1955.* Farm Foundation, 600 South Michigan Avenue, Chicago, 5, Illinois.

even more critical when the costs are to be divided among the participants in a partnership arrangement for resources development.

Multiple purpose development involves a complex inter-relationship between nonreimbursable costs and those which man be reimbursed such as the costs of developing irrigation projects and hydroelectric facilities. There is always the danger that, in order to show a project to be feasible, the public benefits may be calculated to be much larger than is actually the case. This is most likely to happen in the cases of those benefits for which well-defined procedures of measurement do not exist.

In some instances, Congress has stated through legislation that specific kinds of development are not expected to reimburse the costs in full. For example, federal irrigation projects are exempt from paying interest on construction costs. This is a matter of long-standing public policy whether or not you or I approve of it. This is quite different from a situation where one phase of development is subsidized by others as a result of the manner in which benefits and costs are computed and allocated.

Obviously, if an undue proportion of the costs of a development are charged off to the public benefits and are assumed by the general public through the national treasury, we have an indirect subsidy to the private portion of the development. Since the partnership policy is already under fire because the private participants have limited their activity to the profit-making aspects of development, it appears that subsidy of the private partner by the public partner would not be acceptable policy.

The most difficult aspect of measuring costs and benefits relates to those values not priced in the market as contrasted to market values determined with reasonable ease. The extra-market values, on the other hand, are difficult to define and there is no well-accepted procedure for measuring them in monetary terms. And yet, if such values as recreation, fish and wildlife, and health and sanitation are to receive appropriate consideration, it becomes critical that their value be expressed in terms that make it possible for them to compete with other resource uses in the decision-making process by legislators and administrators.

The scope of the problem becomes more apparent when we note that those benefits that fall into the extra-market category are increasing in importance with a growing population and more leisure time. The future will undoubtedly bring further reductions in the length of the work week with an accompanying pressure on recreational resources.

Here, then, is one of the questions to be raised regarding the partnership policy. Will a combination of public and private development give as much weight to extra market values as a program of comprehensive public development? There is always the danger that, in our dollar conscious society, we will forget that development of resources to achieve

the maximum in human satisfactions involves other values than those which can be measured in monetary terms.

Requirements for Cost Sharing

The requirements for cost sharing between the public and private participants in resource development are not uniform throughout the various government agencies. The amount or proportion that the public must pay in connection with resources development varies among such agencies as the Bureau of Reclamation, the Army Engineers, and the Soil Conservation Service. There is no logic to this situation other than the strange logic which sometimes is associated with politics. It seems obvious that the rules of the games should be uniform in all cases where public dollars are being spent for resource development under the administration of different agencies of the federal government. This is not so and leads to a situation where local interests concerned with a particular resource development find it worth while to shop around and choose from among the public agencies the one that can give them the best deal.

The most notable lack of uniformity in requirements for cost sharing on the part of the federal government is to be found in the case of flood control. There are many examples of partnership arrangements for flood control between the federal government and local public units. These local groups learned long ago that the federal government could assume a larger burden of the partnership when operating through some agencies than through others. We can be sure that the private partners in other phases of resources development will be quick to take advantage of any differences in cost sharing that may exist in the present laws and regulations. It would appear that any private enterpriser considering a development under the partnership policy might find it desirable to explore the alternative partnership arrangements available from different government agences. This might be the first and most important step. It could be more important to his profit position than the natural resource situation. In fact, it might determine his choice of the natural resource situation to be developed.

As suggested earlier, this does not seem to be a logical procedure to expect in connection with the expenditure of public funds by federal participants in the partnership policy. Uniform rules of the game would appear to be essential if the partnership policy for resources development is to function in a manner to protect the public interest.

Partnership With Various Levels of Government

President Eisenhower included in his list of possible partners with the federal government in resources development every conceivable com-

bination of public and private effort. Here again, the over-riding emphasis on power generation has obscured the meaning of the partnership policy except as it relates to private utility companies in partnership with the federal government. If a prime purpose of the partnership policy, as implied by the President, is to increase the efforts brought to bear on the problem of expanding the capacity of the resource base to serve a growing population and a growing economy, then more attention should be given to the double-edged possibility of partnership arrangements. These include federal partnerships with other levels of government than federal. For example, the states seem to be a forgotten force in the resource development situation.

If resource development is to keep pace with the growth of the nation during the next twenty years, the combined effort of all public and private groups and agencies will be required. If the full potential of public and private effort is to be realized, the partnership policy must become broader than is now indicated by the public-private power controversy. There is more to be done than both public and private interests are likely to accomplish unless these facts are recognized.

Conclusions

In theory, the partnership policy as outlined by President Eisenhower in 1955, is a sound and workable plan. It is consistent with traditional policies of government assistance to private enterprisers in the solution of their problems. The major goal of resource development should be to increase the capacity of the resource base to support private enterprise. It cannot be otherwise in a capitalistic economy. If the partnership policy is to succeed and be accepted, however, it must recognize that the problem of resource development goes beyond the possibilities for profits in providing facilities for *one* water use out of many. This writer feels that success of the partnership policy depends in large measure on adequate consideration of the five points discussed above.

DISCUSSION: THEORETICAL CONSIDERATIONS OF WATER ALLOCATION AMONG COMPETING USES AND USERS

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The objective of Professor Timmons' paper, as I read it, is to provide a set of economic principles as a theoretical framework within which certain confusions in water use can be resolved. These arise from national, regional, state and community economic developments. The stated goal

is to maximize long-run social benefits from the use of the water resource. To this end economic theory is provided to guide the necessary technical and legal considerations in the process of allocation.

Timmons contends that this process is not working as it should. His words are that "Historically, this process has been the reverse. Physical means of control have been initiated or laws have been passed or court decisions have been rendered which either prohibit or are not consistent with the most efficient use of water resources." This indictment raises two major questions. What is the most efficient use of the water resource? Is the order of economic-physical-legal relationship a causal factor?

Before pursuing these questions in terms of Timmons' presentation, I feel compelled to clarify certain terminology uses. Common practice is to divide water use into two classes: (1) consumptive use, and (2) nonconsumptive use. Contrary to the illustration used by Timmons, the use of water in the home usually is considered a nonconsumptive use. A large part of the used domestic water supply can be reclaimed for reuse. For example, it is becoming common practice to make downstream use of upstream effluent. On the other hand, the use of water for air conditioning may be a case of the consumptive use of water. Very often a significant proportion of water is lost through evaporation. Further subdivisions of water use in economic analysis appear somewhat superfluous.

Turning next to the problem of the efficient use of water, Timmons approaches this question by way of an old and familiar economic tool, the theory of the firm. We have made use of this framework before for allocating resource inputs in farm production. How well does it apply in the case of the water resource? An underlying assumption, in the use of the transformation, function, requires a constant water supply. A distinct characteristic of water is its variable quantitative nature. The seasonal deficiency concept helps explain floods and droughts, water erosion and wind erosion. There is difficulty rationalizing this characteristic with the economic model.

If micro theory tells us how to make beneficial use of water on the farm, does it tell us also how to allocate water over space and time? Are we interested in a theory for the firm or for broader economic policy purposes? The latter objective is implied in the paper. Micro-economic theory is offered as the means to this end. There are a number of economists who would object to applications of the theory of the firm to aggregative economic problems.

Looking again at the application of the theory of the firm and marginal analysis, if the marginal value product is to be the criterion in allocating water, then the irrigated farm as such is doomed. In these terms irrigation represents a relatively uneconomic use of water. It is estimated that

manufacturing produces about fifty times as much product value per gallon of water consumed as does irrigation.[1]

Are we overlooking some important considerations in water allocation. Apparently, only about one-fifth of the total run-off of our streams and rivers is put to economic use. This means that four-fifths of our surface water doesn't enter into the analysis as an economic good. There has been built up a body of legal doctrine to provide economic protection to those who have appropriated water from the stream flow. This protection has permitted the productive plant to develop with some assurance of the use of a necessary amount of water. Conflicts have arisen when the water supply became insufficient to irrigate the amount of land that could be irrigated.

As a further consideration in water allocation, legal doctrines have given way to certain preferences. These preferences are largely outside the mechanism for market pricing. What is the marginal value product of a glass of drinking water on a hot day? The question was answered by a scale of preferences as exceptions to the rule of priority. By this rule priority was given the higher right between those using water for the same purpose, say agriculture, and those desiring it for domestic use as against agricultural use. These rules tend to ration the scarce resource instead of placing it in the market place for bargaining.

It is economically permissible to switch among water uses and water users within the framework of existing legal doctrines. In referring back to the question of the order of economic, physical and legal relationships, I find no evidence to support the idea of a one-way causal relationship. Physical changes appear to affect economic changes which in turn appear to affect legal changes. These work in multi-directions and often encompass political and educational factors. The physical, economic and legal dimensions of water use require an integrated approach to economic efficiency. Water allocations must be physically possible, legally permissible and economically feasible.

There is more to be said. We need a macro-economic framework for the efficient allocation of water in the aggregative sense. Benefit-cost analysis has not done this very satisfactorily. Analysis needs to be carried forward via a set of economic principles to arrive at an acceptable answer. National income accounting may be an aid. If such an approach is possible, benefit-cost analysis might well receive help from the concept of social accounting to meet the objective laid out by Timmons.

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[1] See an article by Francis Bello, "How are we Fixed for Water," in *The Mighty Force of Research*, McGraw-Hill Book Co., 1956, p. 108.

DISCUSSION: CAN WATER BE ALLOCATED BY COMPETITIVE PRICES?

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At the beginning of his paper, Professor McPherson set forth a threefold objective (1) to establish a conceptual framework for evaluating the economic status of water, (2) to identify the components of an institutional framework that would facilitate the competitive pricing of facilities that make water useful, and (3) to suggest the extent to which it may be possible to use competitive prices to allocate the cost of water-producing facilities.

You will doubtless agree with me that he has made some interesting and pertinent observations regarding each of these issues. But he has concerned himself mostly with the establishment of a conceptual framework. Rather than answer the question "Can water be allocated by competitive prices?," he has addressed himself more to the problem of describing the conditions necessary for the use of a price system in the allocation of water resources.

A conceptual framework of this order naturally has its place; and McPherson should be commended for his efforts in its formulation. If I were to make any single criticism of his paper, however, it would be that he has dealt almost entirely with a framework calling for pure competition. Most of us recognize the importance of this concept in theory. But it is a rare phenomena in the world today. Even with property objects that can easily be held in one's exclusive possession, good examples of pure competition are seldom found outside economics textbooks. And when we deal with products such as water whose economic value is highly associated with institutional factors, it is hard to even imagine the operation of a purely competitive pricing system.

Since almost every conceivable system of water rights involves elements of monopoly power, it is important that we think in terms of imperfect competition. Viewed in this light, the question "Can water be allocated by competitive prices?" can be answered "Yes, provided the proper conditions exist." Drinking water was sold under a competitive pricing system for awhile following the San Francisco earthquake and fire of 1906. This situation arose (1) because the supply of suitable drinking water was definitely limited relative to current demand (2) because the supply was controlled by a few people, and (3) because the people with access rights to these supplies recognized their short-run opportunity to profit from the sale of this necessary commodity.

As McPherson has noted, two factors bear emphasis every time we try to duplicate this situation. One of these involves the scarcity factor while the other concerns the basic issue of water rights. It is the scarcity or relative inaccessibility of water that gives it economic value. Water has little sales value so long as the supply is plentiful and everyone enjoys an equal right of access. Most of the market prices assigned to it are directly related to the costs associated with its provision, purification, storage, and transportation. Thus the farm irrigator must pay a water charge when his water is stored in a reservoir for later flow through a canal to his fields. Industries must pay the cost of pumping water supplies from underground sources. And householders must pay for the costs municipalities incur when they provide, purify, and pipe water to individual homes.

With each of these examples, prices tend to allocate water resources in the sense that no one will pay for water when he feels that its cost exceeds the satisfactions or marginal value products associated with its use. But these examples seldom involve competitive pricing. In our appropriation doctrine states and even in our riparian doctrine states, one's supply of water is much more dependent upon his possession of a water use right than upon his ability to bid up water prices. A person or industry with great need for water can often buy the land and water rights of others. But even so, it may be observed that the holders of water rights often use their water resources in a lavish or even wasteful manner at times when these same resources could be put to more productive use by other operators or other enterprises. A somewhat similar situation prevails in most cities where every household is assumed to have an equal water right and where water rationing—usually a limitation of one's right to take a bath or sprinkle one's lawn—is used in place of competitive pricing policies to allocate scarce water supplies.

A friend of mine in the Near East recently wrote me that "marginal utility has not as yet been born in this part of the world" and that one's economic success there is determined mostly by his position in the power structure. A very similar situation exists in this country so far as our use of water resources is concerned. Except for an occasional irrigation district or water agency that sells its excess water to the highest competitive outside bidder, competitive prices seldom play an important role in the allocation of water resources. Possession of a water right is the important thing. And the nature of these rights is always tied to our concept of property rights in water and to the willingness of society to adjust or change these concepts.

As we talk about the possible use of competitive prices to allocate water resources, the central issue is not so much one of can competitive prices be used for this purpose as it is one of should they be used for this pur-

pose. This question opens the way for considerable speculation. On the one side, it may be noted that a shift to a competitive pricing system could lead to a more efficient and productive use of our water resources. This shift, however, would tend to disrupt many of the vested interests that land owners and others now hold in water. And by ignoring the issue of extra-market values, it might easily upset many of our currently accepted priorities in water use.

Let us assume for a moment that a competitive pricing system were in operation and that the water resources in every community tended to go to the highest bidders. Under this system, domestic and municipal uses would probably receive the highest priority while many industrial uses would come close behind. How would the farm irrigator in the West react to the proposition that he bid for his water supplies in open competition with industry, particularly when it is claimed that water has a much higher marginal unit value in industry than in agriculture? Could our cities or our paper mills outbid their competition and thus purchase the right to dump their untreated sewerage or industrial wastes in our public streams? How would we protect the rights of our sportsmen and recreationists? What weight would we give to our need for a predictable and uniform flow of water for navigation purposes or for diluting and washing away the effluent from our sewerage disposal plants?

Similar problems also come up on the time and place side. The humid-area farmer who irrigates only during dry seasons may have to purchase water supplies he might not need. The western irrigator would operate at a great disadvantage if he finds that he must buy his water in the open market on a seasonal or annual rather than a long-term basis. And the downstream operator will often suffer a disadvantage relative to upstream operators.

Still other problems would arise concerning the control of water resources offered in the open market. Should every holder of a water right be free to market his water or should all rights be revested in the State? Should the State and Federal governments supervise all future water resource developments or should their development be left to private capital? Should privately-owned water rights and the unearned income associated with the private sale of water be subject to special taxation? And should these taxes and the revenues derived from the public sale of water be earmarked for special purposes?

As we leave this question, we should all remember that our growing demand for water is bound to complicate the problem of seasonal shortages in many areas. In meeting this problem, we must seek ways and means for putting more and more of our available water resources to their optimum use. A system of competitive pricing suggests one means for

promoting this goal. As such, it provides a means that we could use in getting some of our water rights owners to transfer their poorly utilized water resources to others who can put them to more productive use. This system also could provide the impetus for a shift from our present riparian and appropriation rights systems to a system under which our surplus public waters would be allocated and periodically reallocated to beneficial uses on a permit basis.

All things considered, I doubt that any of us will encounter much enthusiasm for a complete shift to a competitive pricing system for water. People naturally resist the idea of paying for what has been treated as a free resource. For most people to have an opinion, far too little is known about the impact that this system might have upon individual operating costs, incomes, property values, and the individual businessman's prospects of continuing as a water user. More experimentation with this approach is desirable. Any changes that come in this direction should come on a piecemeal basis with adequate safeguards to protect the public interests in water.

DISCUSSION: ECONOMIC IMPLICATIONS OF THE PARTNERSHIP POLICY IN WATER RESOURCES DEVELOPMENT

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Professor Huffman points out that there is little, if any, experience to which one can turn in the way of functioning projects or programs demonstrating the partnership policy in action. He goes on to say that "it appears that the economic implications of the partnership policy must be analyzed from the standpoint of intent rather than performance."

This makes meaningful economic analysis of the partnership policy extremely difficult.

However, I think Huffman has very effectively focused attention on the more important issues in water resource development. He reminds us that "because water is rapidly becoming a scarce resource in many areas, it becomes essential to make the most complete use possible of the available supply, if we are to fill all of our requirements." This places increasing need for planning water resource development for multiple purposes.

He goes on to question if the Eisenhower partnership policy does in fact recognize the need for broad multiple purpose development. In raising this question, Huffman is mindful of the limited experience available

[1]Formerly Associate Professor in the Department of Agricultural Economics, University of Nebraska. The ideas presented here are the responsibility of the author.

to illustrate the practical application of the partnership policy. A review of the popular writings and congressional debates on this point, however, leads Huffman to doubt that there is a sufficiently clear understanding of the implications of the multiple purpose approach to resource development.

Progress has been made in the last twenty-five years in getting wider appreciation for the mutual benefits to be achieved from comprehensive planning for multiple purpose water resource development. However, the nature of the problem has made, and will probably continue to make progress difficult.

Planning for the development of a river basin for power, recreation, irrigation, navigation, municipal water supplies, and other purposes requires knowledge of technical subject matter as well as a broad point of view. Engineers however tend to become experts in some particular aspect of the resource development problem. This tendency is accentuated by the division of responsibilities among the many agencies involved in resource development. Consequently, the number of people who have the necessary technical knowledge as well as a broad point of view required for effective multiple purpose planning will continue to be limited. At one time, T.V.A. personnel (regardless of specialized training) were encouraged to develop a broad point of view. It is not clear that this policy has been continued.

Huffman properly points out that the most important issue in water resource development is not the question of public vs. private development. On the other hand, it is precisely because of deficiencies in our approach to river basin development that this conflict has a tendency to take the center of the stage. I think it is fair to say that we have failed to exploit the "mutuality of interest" inherent in integrated multiple purpose planning whether the development of the water resources of a river basin is carried out by private or public interests.

The benefits to be derived from integrated planning are so great that they cannot be ignored. For example, Huffman refers to the mutual benefits to upstream and downstream power interests that accrue as a result of integrated and interconnected power systems. The benefits to be derived from such integrations and interconnections are so enormous that private and public agencies in both the Bonneville and T.V.A. area have cooperated in effecting such agreements. These benefits can be increased by recognizing the "mutuality of interest" in comprehensive multiple purpose planning at the outset.

Huffman has helped clarify the issues involved in the discussions on reimbursable and nonreimbursable costs. One fact generally recognized is that the returns from the retail distribution of electric power are gener-

ally much greater than the returns from the production and wholesaling of power. This fact should no doubt be considered in negotiating a partnership agreement.

On measurement of benefits and costs, Huffman shows the importance of extra-market values. He also develops an important idea in the following statement: "In some instances, Congress has stated through legislation that specific kinds of development are not expected to reimburse the costs in full. For example, federal irrigation projects are exempt from paying interest on construction costs. This is a matter of long-standing public policy whether or not you or I approve of it. This is quite different from a situation where one phase of development is subsidized by others *as a result* of the manner in which benefits and costs are computed and allocated." A corollary proposition is that the computation and allocation of benefits and costs should be used to clarify and inform the public rather than confuse and misinform regardless of which group or agency is responsible for the calculations.

One point that cannot be over-emphasized is contained in the following statement by Huffman: "If resource development is to keep pace with the growth of the nation during the next twenty years the combined effort of all public and private groups and agencies will be required."

THE ROLE OF FARM MANAGEMENT RESEARCH IN THE UNITED STATES: 1956-66

Chairman: L. A. Bevan, University of New Hampshire

A FRAMEWORK FOR FARM MANAGEMENT RESEARCH PROGRAMS IN THE DECADE AHEAD

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FARM management research or production economics research is supposed to provide information and analyses that will be useful to the farmers and to those responsible for public programs affecting agriculture. To do this the researcher attempts to discover ways that will facilitate choice of production patterns and resource use consistent with the goals and objectives of farmers and consumers. One can suggest that research money should be invested where the returns will be highest in terms of social benefit. Unfortunately we still need some research on how to measure social benefit. There is also the possibility that the result of planned research will not be a solution to a problem, but will merely open the way for further research. Therefore, at best, I hope only to indicate a few guide posts to some general areas of research which appear productive and needed to round out and advance our present position.

Background for Research in the Years Ahead

Continued growth of the nation's economy appears relatively certain. Productive capacity in plants and equipment is increasing rapidly accompanied by technological advance. Our population is rising. Although there is disagreement among forecasters as to the extent of the above conditions, most believe that we are in a growing industrial economy. Agricultural incomes and prices will continue to feel the impact of our growing economy.

If, as appears likely, the current trends in agriculture's supply and demand functions continue, the price-cost squeeze in many areas of agriculture will remain in effect for some time. Many farmers are leaving agriculture because of better wages in other industries, low returns to inefficient farm management, and insufficient-sized capital units needed to earn an acceptable income. With the possibility of fewer farmers, operation of larger farms with more capital and with new technology will require adjustments involving problems of specialization, scale of operation, risk and uncertainty and managerial ability to make adjustments. When these adjustments lag, "surpluses" are created.

Agricultural Production Adjustment

Agricultural production adjustment, as used here, refers to the changes in the use of farm resources in order to attain the greatest value of product[1] from given resources (least cost to produce a given product) during a relevant time period. The adjustments required to bring about such an efficient allocation of resources take place (a) within the firm (b) among farms, and (c) among industries. The environment of a growing economy with its business cycles and changing technology is a large contributor to the need for adjustment.

Today the forces advancing technology are working at an increasing rate both within and without agriculture. To illustrate the extent of these changes we look back less than 300 years to the days of the wooden plow and oxen, less than 100 years to a walking plow and many of us can remember the shift from horses to tractors and the days when a farm house wired for electricity was a novelty. The relative productive potential of various forms of capital, labor and land have changed and are changing rapidly within the firm, among farms and between agriculture and other industries. Such things as fertilizers in new forms of liquids and gases with their accompanying methods of application, irrigation for humid areas, chemical sprays and new crop varieties necessitate changes in the farming methods. The increasing industrial demand for labor and its accompanying impact on wages speeds up the trend of capital-labor substitution in agriculture. Further, whole areas find it expedient to shift the balance of resource allocation from one crop or variety to another. The shift to hybrid corn is, of course, the classic; but cotton has shifted west and new varieties of soybeans have moved that crop north.

On the one hand, technical innovations give the farmer control over his environment and reduce the uncertainties of production with which he is faced. For example, fertilizer, power equipment, irrigation and chemical sprays permit the farmer to gain relatively greater control over plant growth, vagaries of the weather and insects. On the other hand, the possibility of having to make adjustments in farm organization because of obsolescence of present equipment and techniques is increased.

Risk and Uncertainty

In spite of the help of technological innovations, unforeseen fluctuations of crop yield, animal disease and product quality are still with us. Fluctuations in farm production and income result. Looking ahead farmers make the best decisions they can under these circumstances. But in looking back they often have made an inefficient use of resources. When

[1] The value usually is expressed in monetary terms, but nonmonetary satisfactions such as security and aesthetic appreciation of beauty may also be involved.

the individual fails to maximize income from his resources, society receives less total product from the given resources than might have been possible.

The problem, however, is not necessarily one of eliminating change. Eliminating the change could eliminate the product. For example, change in weather bringing rain and sunshine alternately is ordinarily required for crop production. The farmer wants the change in weather to occur. He would, however, like to control the weather or at least forecast it accurately. Solutions to uncertainty problems, therefore, takes two directions (a) discovery of methods that permit controlling of physical and socio-economic phenomena and (b) forecasting these same conditions. Our social and economic innovations for this purpose include our republican form of government, credit policies and insurance methods. Physical forces are usually brought under control by mechanical means, e.g., chemical weed control and irrigation.

On the other hand when outright control is not possible or feasible, forecasting the change permits planned adjustments or at least the building of flexibility into plans. Better methods of forecasting can be devised when we discover the nature of changes and their relationship to other variables. Reduction of a state of uncertainty to some degree of predictability is the goal.

Returns to Scale

The trend of capital-labor substitution in agriculture gives rise to problems involving scale of operation. Many of the new techniques of production such as the cornpicker-sheller require relatively large investments. A relatively large acreage has to be covered or large usage made of the new technique if the farmer wishes to take advantage of its cost-reducing possibilities. Can the farm enterprises such as the hog enterprise or the broiler enterprise be profitably increased in intensity through use of labor released by the new machine or technique such as the picker-sheller? Do we need larger farms to permit use of new technology? Does specialization become more profitable in certain enterprises such as broiler production as their scale is increased? What is the place of the small farm in an industrial economy? Can part-time farming lead to efficiencies or inefficiencies because of the size of operation? These are all problems of finding the optimum scale of resource use under new technology and/or changed economic conditions.

Frictions to Adjustment

Some technologies such as fertilizer usage are easily put into practice since the costs involved are mostly variable. Others such as irrigation re-

quire investments in relatively fixed forms of capital equipment. Once resources have been committed in such fixed forms, the degree of adjustment or change in farm organization is limited. Farmers often recognize some other resource combination than they are using would be more profitable, but once the dairy barn is built it is difficult and costly to change—not that all forms of fixed capital lead to inflexibility. Buildings and equipment are often specifically designed for flexibility in use. However, such designs often involve a loss of efficiency for any one use. Frictions to produce adjustment arise not only because of the inflexibility introduced by past commitments, but also because the farmer views the future with uncertainty. An investment that appears profitable today may be out of line tomorrow and difficult to adjust.

The capital requirements of much of the modern farming equipment are so high that many individual farmers with limited capital are unable to meet them. Resource allocation problems arise. Would new credit systems lead to greater efficiency in use of resources in such cases? Should such farmers be encouraged to leave agriculture and use their labor and limited capital in areas where they can be used in more productive combinations? Other frictions to adjustment include lack of knowledge, custom and institutions such as leasing and credit systems. Hence, farmers and public administrators must not only determine the most profitable farm organization and resource use, but also overcome frictions to any necessary adjustments. Our agricultural supply problems are aggravated, of course, by the frictions to resource-use adjustment.

Information Required for Problem Solutions

First, for the individual farmer to adjust his production pattern efficiently requires a knowledge of the input-output and substitution relationships among resources and products. In order to determine the optimum level of nitrogen fertilizer application on corn you have to know something about the effect of nitrogen on corn yield. What is the effect of the first 40 pounds of nitrogen applied, the second 40, the third 40, etc.? When does it no longer pay to add nitrogen? The prices of the fertilizer and corn can be attached to the physical inputs and outputs to determine the answer. Other problems involve substitution information. The optimum feed combination such as protein and carbohydrate or forage and grain to achieve a given livestock product are cases in question. Similarly problems of substitution over time arise such as fertilization in soil build-up programs which require information about residual crop response to fertilizer. Recognition of the need for production coefficients is not something new. However, the need for estimating the entire physically rele-

vant range of the production relationship and not just an average of what farmers are doing at the moment has not always been kept in mind.

Second, more information on reducing the uncertainty with which our present production coefficients (input-output data) must be viewed would lead to more efficient use of farm resources. The probabilities and extent of variation in the coefficients (input-outputs and substitution rates) are needed. Such information leads to prediction of variability of income or outcomes from different resource combinations in different enterprises. To what extent can resource combinations be made that lead not only to higher income, but less possibility of variation of income? To what extent can diversification stabilize income? The use of one enterprise to offset fluctuation in income from the other depends on these variations and the nature of their correlation. Such problems can be approached more confidently when the probability of variation in the physical input-ouput coefficients are known. Price variability resulting from demand shifts, supply shifts or business cycle change are equally important, of course. In general, we need more fundamental information as to how to best formulate expectations in the light of variability and changes.

Third, more information about technological change would be useful in predicting possible adjustment problems before they actually arise and thereby, taking them into account in longer-run planning of capital investments. Both individual farm problems of resource adjustment and policy problems involving farm surpluses and aids to farm resource allocation designed to adjust resource-use among farms and among industries could be better solved if the impact of technological change in agriculture production were predictable. Better long-run price forecasting would result. Individual farmers contemplating investments of a long-run specialized nature such as buildings and capital equipment would like nothing better than a peek into the next 10 years of technological development.

Present Status of Information

Production function (inputs-output relationship) research has made great strides since World War II, especially in the recognition of the need for broadening estimates to include the entire input-output schedule and substitution possibilities among factors of production. Similarly the usefulness of attaching estimates of variability to such coefficients has been emphasized although little has actually been accomplished by researchers in making empirical estimates. Some of the methodology and empirical estimating techniques are becoming available, however.

Optimizing theory has been applied to agricultural economics prob-

lems and the way pointed for sounder and better estimates of the most efficient resource combinations. Linear programming and other tools for planning efficient farm organization and resource use have received publicity and have been applied with limited success partly because of the scarcity of production coefficients. The fields of risk and uncertainty are being approached. However, there is still no complete theory of decision making that can be depended upon to lead to optimum results even on the average when working in a field of less than perfect knowledge. There is room here for lots of basic research.

Similarly, research on technological development has seldom reached a stage of empirical estimation. Mostly the literature is concerned with vague literary analyses of the general nature of such impact on economic development. What are the factors affecting the rates of technological change in general and for specific types of innovation?

Implications for Future Research

With all of the changes expected in technology and values of farm products and resources, the farmers will have to make changes in farm organization. To make such adjustments efficiently will require a great deal of accurate information about physical input-output relationships of farming. Therefore, I feel the emphasis in farm management research is going to remain on input-output relationships. The trend toward more emphasis upon the complete input-output schedule will continue. Substitution relationships such as a forage and grain substitution in dairy and beef feeding will be explored. In terms of the theoretical production economist, we will spend more time deriving estimates of the entire production functions. A great deal of the theory and methods for analyzing resource adjustment problems is already available but of limited use until the production data are acquired.

Since research in this area of finding physical input-output coefficients is also a problem of the agronomists, animal husbandry men and agricultural engineers, the trend toward cooperative work with these people will continue to be profitable. In my opinion, a great deal of the research in this area can best be carried on through combining the results of controlled experiment with on-the-farm survey and record information. Often controlled plot data plus farm records and surveys can be used to synthesize crop performance relationships for various rotations and fertilization levels. Engineering data are often easily extended to the farm level.

The necessity of farm organization adjustments being made with less than perfect knowledge of outcomes will continue to challenge the researcher and the farm manager. Instead of just making estimates of the

input-output relationships such as the effect of fertilizer on corn, we also need estimates of the variation to expect in these effects. The farmer can then decide upon the value of diversification and other techniques of insuring stability of income.

Another approach to the uncertainty situation might be an attempt to forecast trends in technological development. A systematic analysis of the potential results of research under way is a real possibility. For example, irrigation technology has reached the stage where humid area irrigation using moveable sprinklers is possible. Some isolated input-output information including different moisture levels, fertilization rates and plant population rates is available. In order to assess the impact of such a technique, the resources available for its use might be estimated. Estimated and/or projected demands for water by households, industry and nonirrigated agriculture might be worked out to see whether or not various regions of the country have the necessary water and the possibility of enough returns from irrigation to warrant installation of present irrigation systems. If the potential costs and returns to irrigation are sufficiently favorable, a shift of production within areas and among areas may take place. An approach to innovation studies such as this one in a manner broad enough to cross regional boundaries could be productive not only in predicting future adjustment area, but in pointing up areas of interest to innovators. Such information would be useful in planning investment in resources of relatively fixed nature such as capital equipment and for predicting farm product supply changes.

Areas of Increasing Importance

One of the major areas for agricultural production economics research appearing on the horizon involves study of the human resource. Low income areas and small farm problems, while involving adjustment in all resources, may especially require an understanding of the farmer—his potentialities, capabilities, and goals. Are we wasting human energies and capacities in areas on farms where these resources are less productive than they could be in other areas or in other industries? Which do you move or change, the human resource or the physical resources such as industries and capital? All are relatively more mobile today than in the past.

The development of managerial potential in farmers usually takes years of experience and training. Can managerial capacity and/or abilities be recognized early enough to steer people into the right jobs? Managerial ability is very important because the way in which farmers make decisions and formulate expectations has great impact on resource use.

Better farm programs and policy would be possible if we knew how the farmer makes these decisions.

In Short

Agriculture is in and will remain in a state of change. Efficient combination of farm resources is made difficult by the need for continual adjustment. Research can aid in making adjustments efficiently by furnishing to the farmer and public administrator information about physical input-output relationships of farming. Such information must include estimates of variability and aids to making decisions with less than perfect knowledge of outcomes. Since adjustments are often painful, concern for the welfare and adjustment of our human resources is apt to increase.

INSTITUTIONAL CONSIDERATIONS IN FARM MANAGEMENT IN THE DECADE AHEAD

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ALTHOUGH it is not the purpose of this paper to define institutional factors, some brief consideration of that point is probably necessary to a clearer understanding of sections of the material to be covered. I will accept the definition of institutions as presented by Raymond Penn.[2] He considers them essentially as the working rules that society has established to govern human behavior. I will also interpret this concept of institutions broadly enough to include, the way people do things, the way they plan, act and react.

Probably more meaningful, in this context, than any definition of institutions is the basic research approach of the so-called Institutional School. This approach does not mean singling out institutional factors alone, but rather including those institutional factors that are important in a pragmatic approach to the problems facing various segments of agriculture or the whole economy. Again we can refer to Penn for a very crucial point that must be made clear in a discussion of institutional considerations:[3] namely that it is not sufficient just to recognize, or study the influence of institutional factors; we must accept that the answers to many of our problems can only be found in changing some features of the economic institutions too often accepted as the fixed framework within which we work.

Accordingly then, I will discuss institutional considerations in farm management in terms of those important changes to be made in which the changing of economic institutions will play an important role. This of course must be restricted somewhat in scope to the field of farm management and so will not cover directly the broad field of agricultural policy in which economic institutions are so important in shaping the actions of people and changing the patterns of our agriculture.

The Important Changes to be Made

There are many studies and scholarly treatments dealing with changes suggested or needed in agriculture in the decade ahead. For our purposes we can draw primarily on John D. Black's recent paper on "Agriculture in

[1] The comments and suggestions of Raymond J. Penn have been very helpful in the preparation of this paper.

[2] Raymond J. Penn, *Resource Productivity, Returns to Scale, and Farm Size*, p. 182.

[3] Raymond J. Penn, "Needed Institutional Adaptations to Implement Economic Development." Paper given at Association of Southern Agricultural Workers' meeting. Louisville, Kentucky, February 8, 1955.

the Nation's Economy" to summarize the relevant changes we can expect in agriculture.[4] The role of economic institutions in effecting these changes can then be considered directly.

The important changes in farming, that Black has concluded are going to face us in our particular area, can be summarized as follows: (1) There will be a definite decrease in the number of farms, with, of course, an associated increase in size of farm.[5] (2) The remaining farms will employ more productive resources per worker.[6] (3) Agricultural production will continue to increase and this increase will be primarily in the form of higher yields (per acre etc.).[7] (4) The increase in production will be accomplished with a reduced labor force[8] by substituting capital for labor.[9] (5) The price decline will level off some but we will continue to be less and less of an agricultural nation.[10] This will mean fewer farmers using more capital to produce more and getting less for it.

The important basic thread of these changes is that the position of agriculture in the nation's economy is changing, due more than anything else to technology and the will of people. This change will require major changes in the whole pattern and attitudes of farming in making farm adjustments to maintain family income within this changing framework.

Areas where institutional considerations will be important

These changes have many implications for farm management. For the purpose of discussing institutional considerations, these implications can be summarized into four general problem areas in which the changing of economic institutions is likely to be an important part of the solution.

First, the problem of increasing capital requirements and obtaining control of sufficient resources to achieve an economic unit will be critical to beginning farmers and to many others who must change or expand their resource base to achieve a livable level of income. This problem of getting control of resources is an old one but will continue in even more severe proportions. This means that agricultural credit and leasing are areas to be examined in exploring institutional changes.

Second, technology is going to play an important role on individual farms and the pattern of adoption and utilization of technology is crucial

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[4] John D. Black, "Agriculture in the Nation's Economy," *American Economic Review*, Volume XLVII, No. 1, March 1956. See also the somewhat shorter version in *Journal of Farm Economics*, Vol. XXXVIII, No. 2, May 1956.

[5] *Ibid.*, pp. 13-16.

[6] *Ibid.*, p. 5.

[7] *Ibid.*, p. 11.

[8] *Ibid.*, pp. 15-16.

[9] *Ibid.*, p. 7.

[10] *Ibid.*, p. 18.

in effecting these changes successfully. As Black has also pointed out[11] the use of more rapid turnover capital will be an important part of technological changes. The patterns of adoption of technologies is worthy of some consideration.

Third, although the expectation of a decrease in the number of farms is not complex, the manner in which it occurs will be important. Black has suggested that this decrease in farm numbers will mean a disappearance of about one-half of the existing low-income farms.[12] Although it is certainly to be hoped that this will be the end product it may not necessarily follow that the major changes in the pattern of land holding will consist of some low-income farms absorbing other low-income farms in the process of development. Adjustment and reorganization of farm size will likely go on at all size levels. This adjustment, especially as it may involve low-income farms requires special attention. Development of the income and living situations of low-income farms, whether it is by farm development or movement into part-time farming or out of agriculture, is of concern here as it involves facilitating institutions such as credit and management training as well as the crucial but less tangible factor we might call motivation.

Fourth, the changing structure of agriculture and increasing complexity of the individual farm will make increasing demands on individual management. Accepting that agriculture can look forward to what we might call a "continuous transition" involving a continuous process of adjustment has some implications for our research. It tends to de-emphasize the determination of "ideal situations" and pat paths of adjustment to them. It means more emphasis on having research information of a type and in a form that farmers can use in planning their own continuous dynamic process of adjustment. This also means, of course, that help and training in management itself will be developed considerably, possibly through such institutions as we now know as the farm and home development program, supervised credit, etc.

Let us turn now to a more direct consideration of the institutional factors themselves.

Leasing Arrangements

Leasing has long been an important means by which a farmer gets control of sufficient resources to establish an economic unit with a limited amount of capital. Leasing arrangements have been characteristically very rigid and slow to change as the conditions on the farm changed. This has caused many problems in the matters of equity and efficiency in

[11] *Ibid.*, p. 17.
[12] *Ibid.*, p. 13.

leasing and has probably caused a more serious problem in greatly reducing the effectiveness of leasing as a "step in the agricultural ladder."

Investment per farm has increased so that the capital value of tenant contributions under a conventional leasing arrangement is so high that many beginning farms are still too limited in capital to lease an economic unit. They can no longer get control of sufficient additional resources by leasing. This is a more serious problem with a livestock share lease and with the large machinery investments and operating capital required it is becoming a more general problem.

Credit (to be considered later) could offer some relief to this capital shortage but there are also possibilities within the leasing arrangement itself. There is no reason (in the conditions of equity and efficiency) why we must adhere to the convention of how much the tenant must provide as his basic contribution under a leasing arrangement.

If our time-honored convention of what the tenant contributes involves so much capital that leasing no longer offers him an effective vehicle of capital accumulation and development, then we can consider changing that convention.

Various forms of father-son arrangements have done this, going to the extreme even of the "tenant" contributing only his labor and a corresponding share of operating expenses. With a livestock share lease on a dairy farm this might give a 70-30 sharing arrangement instead of the customary 50-50 but gives the beginning farmer an opportunity to gain control of the resources necessary for an economic unit of operation.

Such arrangements have also been tried on a more commercial basis–outside the immediate family. Admittedly, such a change in leasing terms puts more "at stake" for the landlord and so increases the demands for proven ability and integrity in the person of the tenant. We are not blindly recommending a "share cropper" type of change in livestock-share leasing on the basis of this reasoning. But we do feel that such a change in leasing custom should be investigated and so are appraising[13] the economic contribution it could make to speeding the capital accumulation process of a beginning farmer.

Agricultural Credit

The nature of the agricultural production process with its peculiar credit needs presents a long line of conflicts and incompatibility with many of the established commercial credit facilities. We need not develop them here.[14] The immediate reaction to change the credit facilities to meet

[13] Co-operative project underway between University of Wisconsin and Land and Water Section, PEB, ARS, USDA.

[14] See Sydney D. Staniforth, and Peter P. Dorner, "Better Use of Credit," Public Policy Material, University of Wisconsin, December 1955.

the needs of agriculture is common. But the approach of changing institutions to help solve our problems cannot be most effective by merely matching up necessary conditions at that level of ideal situations. It requires a more intimate insight into what are the most limiting points of misfit between credit needs and available facilities and then providing the research basis on which changes can be made.[15]

In this manner, the first step seems to be establishing with commercial lenders that future productivity of an investment must be weighed along with the conventional security requirements. Future productivity can, with appropriate caution, serve as security for a loan. This approach to what constitutes a favorable credit venture, of course, meets obstacles in the banking regulations; but these are being approached rather effectively by commercial lenders who have accepted the importance of future productivity of loan investments. Having taken this basic step in revising lending policies, other changes such as flexible repayment geared to the flow of income over time from the investment and even open-end development loans can follow quickly by lenders initiative. Thus, the changing of one particular institutional convention (the security basis of loans) can set off a whole chain of modifications that contribute greatly to the effective use of credit in farm development.

This approach to credit problems also focuses considerable importance on planning the effective use of capital on the farm. Immediately we are asked; can supervised credit and management training fill in the farm end of this constructive approach to credit? An important point is evident here, however, in that changing the right institutional convention (on the basis of research information) can be the means by which borrowers and lenders can solve a serious credit problem on the basis of their mutual self-interest in an investment opportunity.

Management Training and Farm Planning

Whether we consider the complex job of management on an established farm in our rapidly changing agricultural conditions or the opportunities that are being passed up on low-income farms, some help is needed in management training and farm planning. It has been demonstrated that such help can be effective in some cases;[16] but there is a research task in this regard to determine how we can do it most effectively. We cannot pass this off as a problem in extension methods.

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[15] See Rudolph A. Christiansen, "An Approach to Development Credit," Unpublished Ph.D. Thesis, University of Wisconsin, 1956.

[16] See R. G. Wheeler, and J. D. Black, *Planning Successful Dairy Farms in New England*, Cambridge, Harvard University Press, 1955, and doubtless many "success stories" to be reported out of Farm and Home Development Programs and other similar undertakings.

For those farmers who do not fall into the class of low-income farmers this could be handled through educational methods. For this purpose I doubt that we even need to study their present decision-making procedures in order to improve them because of the relatively simple manner in which decision-making principles can be presented. It will require more resources to do the job but for this group it could probably be handled directly on an educational basis.

In the case of the low-income farmer, however, some research is necessary to determine how these people can be motivated in a development venture. We cannot explain away the failure to take advantage of opportunities in terms of personal likes and dislikes, lack of management capacity, credit problems, etc. There is more a failure to truly grasp the significance of opportunities as realistically achievable opportunities to them. This is not merely a lack of factual information. It is a failure to accept it as a basis for action. To initiate action, then, these opportunities must become accepted as potentially achievable alternatives. It seems reasonable that some progress within their current situations is necessary to lift their horizons in this manner. If this kind of motivation problem exists in the low-income group, then we need to know about what will be effective in making the initial progress—do we need to first promote productive techniques or a "bankers credit drive" such as the Sure Fire Alfalfa Program in northwestern Wisconsin (loans for lime and fertilizer on very favorable terms to establish alfalfa hay). This is largely speculation but we do need to know more about motivation in the low-income group. This problem, of course, is equally significant as applied to development within agriculture, part-time farming or moving out of agriculture entirely. It also becomes very crucial to the farm and home development program in the question of whether farm development can be the first step to part-time or even moving out of agriculture.

Adoption of Technology

The adoption of technology is really only one aspect of management and planning but it is so important in effecting farm adjustments that it warrants special consideration. Problems arise out of the patterns of adoption of technology primarily because the role of the different types of technology is not clearly established in the farm business.

One general management problem reflected in the pattern of adoption of technology arises when no apparent distinction is made among different technologies. What is needed to develop any particular farm may be visualized as a total collection of technologies to be adopted. If it is not recognized that the order of adoption can be of prior importance the adoption of what are, by themselves, proven practices or techniques can seriously retard development of the farm.

Failure to recognize the importance of the order in which technologies are adopted has also resulted in differential rates of adoption among enterprises. Technology is adopted more readily in grain production than in livestock production. For example we have found that mechanization of dairy production on Wisconsin farms has been adopted largely to increase the standard of living by lightening the work load, while grain production has preceded it considerably.[17] This is due in part, of course, to the adaptibility of mechanization in the two enterprises relative to the average size of these enterprises, but probably also reflects some preoccupation with field improvements.

The adoption of mechanization is characteristically more rapid than other technologies. This is frequently done at the expense of much greater contributions to development possible with less dramatic forms of technology. This is especially serious when adoption of other technologies is necessary first to build up the volume of production to a point where mechanization can be efficient. This lack of planning is made easier by a particular interest in machinery itself. This is not to say mechanization should not be adopted unless it "pays" more than other technologies if it is the result of a considered organized decision. Mechanization often leads the way though under the illusion that it will "solve" quite unrelated production problems.

The only basic answer lies in decisions being based on the organized comparison of the consequences of alternative investments in the farm. This can be helped greatly, however, by more information on the cost structure of machinery use and estimates of returns from all technologies.

Other Institutional Considerations

Although agricultural policy, our biggest area of changing institutions, is not our direct concern here we must recognize it as an important means of effecting the changes needed in farming in the next decade. During the immediate future agricultural policy will be directed toward some restrictive or regulatory purposes. Every effort will probably be made to achieve these farm adjustments on an incentive basis. This means that a great deal of farm management information on the costs and benefits to farmers in pursuing these incentives can help farmers make organized or planned decisions which presumably should increase the effectiveness of these policy measures and so reduce the need for any restrictive policy. Similarly effecting the needed adjustments through changing "natural" institutions would also reduce the need for restrictive policy institutions.

The role of taxation as an institution to effect needed changes in land use is much less in agriculture today than in cases such as the Wisconsin

[17] See Sydney D. Staniforth, "Role of Electricity in Farm Development in the Eastern Dairy Area of Wisconsin," Agricultural Economics Series #13.

Forest Crop law (1927) without being somewhat discriminatory. Errors in assessment and taxation between good and poor land could theoretically deter the development of poor land. In terms of the absolute amount of tax error involved, however, it would have little effect on rate of development.

The overpricing of poor land, compared to its income-earning capacity, certainly reduces the development possibilities on such land and probably contributes in part to the existence of low-income areas. This is quite difficult to change, however, within the institution of private rights except, in part, through a rather slow educational channel.

Relationship to Extension and Action Groups

A fine line is always hard to draw between research and extension (if such be desired). The intermingling of research with extension and action agencies, however, is more extensive when the research approach involves the changes of economic institutions for some further purpose. There are two reasons for this: (1) Economic institutions are not always universal phenomena and so the process of identifying the relevant institutions and determining their relative importance may involve the researcher in a rather intimate association with the problem area and so engender a "natural" follow through on his part. (2) Research leading to the changing of economic institutions can frequently be more effective if developed in close enough contact with the people or organizations who make and change local institutions that they will be informed and effective vehicles of the change.

The research approach leading to the changing of economic institutions, as one method of effecting other changes, may involve working closely with politicians, bankers, a community of farmers or county development committees. This approach does not always lend itself to empirical sophistication; but it can be not only a gratifying experience but also an effective way of accomplishing some types of desired changes.

POLICY CONSIDERATIONS IN FARM MANAGEMENT RESEARCH IN THE DECADE AHEAD[1]

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1. Farm Management Research and Policy Research

ONE may assume agreement that public policy has significant implications for farm management research, and vice versa. In this connection, I shall treat farm management research together with production economics research. They are not synonymous. But important complementary relations exist between them, especially in the area where farm management research and policy research meet.[2]

The reason for the significance of policy for farm management research is not far to seek. Today, policy influences not merely the functioning of the price system and the tenure institutions (including property, tenancy, taxation, and credit) in the framework of which farm management decisions are made, but increasingly seeks to influence also individual prices, outputs, scale of operations, and production practices. Policy objectives are changing abruptly over time. For example, a few years ago the objective of policy was to increase farmers' output with the least possible increase of farmers' income. Now the objective is to increase income with the least possible increase of output. Nor is policy merely concerned with farm income as a whole. Welfare considerations, that is, the effects upon income distribution among groups of farmers, play an increasingly important role.

The more detailed and changeable, in terms of objectives, timing, and variables affected, the interest of policy becomes, the greater is the need on the part of those who propose, make, and adopt policies for information on the probable response by farmers *before* policies are put into effect. Likewise, bringing about the desired response to a given policy *after* it has been put into effect becomes important for those who execute policies. To accomplish this, they need convincing arguments that can be directed at the farmer on the level of his own management decisions. The farmer, on the other hand, is no less interested in an appropriate response to policies. But the farmer's idea of what is appropriate for him does not

[1] Giannini Foundation Paper 155. Constructive comments on the first draft of this paper were made by Chester O. McCorkle, Jr.

[2] Production economics deals mainly with the combination and allocation of productive factors. These problems are important for farm management, but they do not circumscribe the whole field. In other respects, production economics is a broader field than farm management. Factor combination and allocation cannot be understood adequately if analysis is confined to the farm level; production economics must, therefore, deal also with aggregates.

always correspond with what is desired by policy. In these relations between policy and farmer, the results of farm management research, used directly and through farm management extension, are of primary significance.

Policy is mainly interested in the aggregate consequences of the response of farmers. One cannot avoid studying aggregates if one is interested in their behavior. No accumulation and refinement of knowledge concerning the behavior of the individual farmer can take the place of the study of aggregates. On the other hand, a study of the individual's behavior yields hypotheses concerning the variables that must be considered in the study of aggregates and provides valuable clues for the interpretation of the results of such studies. Policy considerations, therefore, require that research aimed at aggregate response and at individual response go hand in hand. This is one of the reasons why it is difficult to draw a line between farm management and production economics and why integration of micro- and macroeconomics is no less important for policy research than their differentiation.

Complementarity between studies of aggregate response and those of individual response does not necessarily mean that all concepts, assumptions, theories, and techniques of today's farm management research are equally useful from the standpoint of policy considerations. One may well raise the question of their comparative usefulness from this standpoint. My assignment, therefore, may be interpreted as relating to some major methodological issues arising from the concern of farm management research with public policy.

2. *Normative and Positive Farm Management Research*

In studying farmers' response to policy, one may differentiate between normative and positive farm management research.[3] The former deals with how farmers *should* respond on the basis of the researcher's assumptions regarding farmers' objectives and possibilities. The latter deals with how farmers actually *do* respond under given conditions. Normative and positive farm management research may not come to the same conclusion.

The major part of farm management research in the decade since World War II has been normative. Budgeting, programming, operations research, and a part of production function studies are of this type. The most useful part of production function studies is based on controlled experiment; this is positive research in the natural sciences rather than economics.[4] Normative farm management research seeks to determine

[3] This differentiation as applied to economics in general is discussed in: Milton Friedman, *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953).

[4] The classical work on production functions along this line was done before 1920.

economic optima and, in its extension phase, to assist the farmer in realizing them. The assumptions and techniques of normative farm management research will be taken up in greater detail later.

Positive farm management research has received less attention since World War II. Only recently have studies been undertaken that focus on understanding the processes and motives of farm management decisions in reality, rather than on assuming objectives and possibilities of such decisions.[5] In industrial management, research in this field is already available.[6] Much positive research has been done in the price-supply relations for different agricultural commodities based on the analysis—on various levels of conceptual and statistical refinement—of time series. Work in the "old" Bureau of Agricultural Economics was of this type. More recently, one may speak of a renaissance of price-supply analyses based on better tools.[7] But knowledge of the farmers' response to other policy influences—those operating through prices of factors of production and their quantitative allocation—is tentative. To take examples from western agriculture, irrigation has been influenced for some time by policies affecting the price of water, the rate structure of electric power, irrigated acreage restriction, and water allocation. Operation of private range is influenced by prices for public grazing and by allocation of grazing permits, both determined administratively. Such policies are hotly and continually debated, and normative farm management research tells what the response should be under its assumptions. Not much, however, is known about the actual response.

At this point, someone might object that normative farm management research uses statistical data, and therefore keeps close to reality. It is quite true that statistical data are commonly used. The handling of such data is often elaborate and interesting from the standpoint of forging tools. However, a study of the numerous articles that have appeared in our professional journals shows that the data are mostly used in a way that must be classed as "numerical illustrations for the employment of tools" rather than as "testing of economic theory by empirical evidence."

Its mathematical tools were not inferior to those in the later work. Some of the literature of the earlier work is cited in W. J. Spillman, and Emil Lang, *The Law of Diminishing Returns* (Chicago: World Book Company, 1924).

[5] See the report by Harold R. Jensen, Cecil B. Haver, Joel Smith, Glenn L. Johnson, P. Woods Thomas, Lowell S. Hardin, and Earl O. Heady on the "North Central Interstate Management Survey," *Journal of Farm Economics*, Vol. XXXVII, No. 5, December, 1955.

[6] William F. Whyte, *et al., Money and Motivation: An Analysis of Incentives in Industry* (New York: Harper and Bros., 1955).

[7] Examples are Daniel B. Suits, "An Econometric Model of the Watermelon Market," *Journal of Farm Economics*, Vol. XXXVII, No. 2, May, 1955; Marc Nerlove, "Estimates of the Elasticities of Supply of Selected Agricultural Commodities," *Journal of Farm Economics*, Vol. XXXVIII, No. 2, May, 1956.

It should not be inferred that positive farm management research makes less use of economic theory. Thünen's early (published 1826) research on the locational pattern of farming "intensity" was highly theoretical, but was positive farm management research.

From the standpoint of policy considerations, normative farm management research is significant in making adjustments after a policy has been put into effect. But positive farm management research is of greater significance for designing a policy and in deciding on its adoption. In view of the relative underdevelopment of positive farm management research during the post-World War II period, a greater emphasis in this area would seem indicated for the decade ahead.

This conclusion would hold even if no methodological questions existed concerning normative farm management research. Such questions do exist and are significant from the standpoint of policy considerations because of the frequent use of analogy. By this, I mean that the assumptions and techniques of normative farm management research are used by the same workers and others in an attack upon problems of policy. The first question of this kind relates to the role of the maximization principle itself.

3. *Maximization: Efficiency Criterion and Scientific Fiction*

The maximization principle is applied in normative farm management research, first, as efficiency criterion for limited operations under restrictive assumptions and, second, as the assumed over-all objective of individuals and groups.

As efficiency criterion, the maximization principle is used, for example, in finding the optimum output under given cost and revenue functions; also in determining minimum costs for each output under given production functions and given price schedules of productive factors, that is, in determining a cost function. For these and similar purposes, the maximization principle is necessary. There can be no disagreement on the usefulness of such operations for farm management research and extension. One may call this application of the maximization principle "efficiency economics," or, more appropriately in some cases, "efficiency engineering."[8]

If applied as the assumed over-all objective of individuals and groups, on the other hand, the maximization principle is a construct, a scientific fiction.[9] It is useful in economics, especially in modern western culture,

[8] A similar differentiation between "economics" and "engineering" is made in: Karl Brandt, "The Orientation of Agricultural Economics," *Journal of Farm Economics*, Vol. XXXVII, No. 5, December, 1955.

[9] Next to mathematics and law, economics is the discipline in which scientific fictions are most common. But the natural sciences, especially modern physics, frequently employ fictions.

if employed in connection with another construct—the "firm." Frequent references in recent economic literature to maxima of individual and social satisfaction indicate that the maximization principle is more and more applied as a fiction.

A fiction is permissible in science if its character is clearly understood. A fiction is a deliberate, conscious deviation from reality. A fiction, however, is not a hypothesis or theory. By itself, a fiction is not intended to be validated by testing with empirical evidence. But a scientific fiction should be useful as a stimulus for or as a part of hypotheses and theories which *can* be so tested. That means the test of a scientific fiction is its conceptual usefulness, its expediency, in understanding, explaining, and predicting reality. A fiction becomes mere dogma and, therefore, unscientific if its two characteristics—consciousness of its fictional nature and conceptual usefulness—are obliterated. There are many examples in the history of science of fictions changing into dogma.

One may wonder whether or not the maximization principle has sometimes become dogma in economics. There is increasing emphasis on techniques that facilitate greater numerical accuracy in the determination of optima for the firm. These same techniques are then used for maximizing social satisfaction of whole groups with no conceptual gain and at the expense of "assuming away" essential economic relations.

The questions arising from such an analogy between firm economics and policy economics are best shown by an example.

4. Firm Economics and Policy Economics—An Example

In the West, one of the most important policy issues before legislatures, courts, and executive agencies is the allocation of water among different uses, such as municipal, agricultural, industrial, and recreational.[10] In a recent paper, this issue is analyzed by superimposing smoothly convex social satisfaction indifference curves on a single production possibilities curve equidistant from the point of origin.[11] In this scheme determining the point of maximum social satisfaction in water allocation between two uses becomes a matter of simple geometry.

For some time, cost and revenue indifference systems have been in use to analyze farm management decisions.[12] But the example just mentioned of applying a related system to policy decisions raises serious questions.

[10] See S. V. Ciriacy-Wantrup, "Some Economic Issues in Water Rights," *Journal of Farm Economics*, Vol. XXXVII, No. 5, December, 1955.

[11] Earl O. Heady, and John F. Timmons, "Economic Framewoek for Planning and Legislating Efficient Use of Water Resources," presented at the Seminar on Iowa's Water Resources, sponsored by the Agricultural Law Center, College of Law, State University of Iowa, and the Division of Agriculture, Iowa State College, Ames, Iowa, March 26, 1956, 22pp. Processed.

[12] S. V. Ciriacy-Wantrup, "Economics of Joint Costs in Agriculture," *Journal of Farm Economics*, Vol. XXIII, No. 4, December, 1941.

The ancestry of a single production possibilities curve, the apparent simplicity of which has made it rather popular recently in farm management research, can be traced to two basic assumptions of programming. These assumptions are, first, existence of limitational factors—especially capital—and, second, independence of decisions regarding the intensity of each process and decisions regarding the combination of processes. The paper in question gives no information as to what limitational factors are assumed. From the standpoint of policy, capital and other factors are limitational only under narrowly defined short-run static assumptions. Under such assumptions, water allocation through legislation, court decisions, and administrative regulation has little meaning.

Under long-run static and also under dynamic assumptions, policy decisions regarding water allocation are not independent of policy decisions regarding water development. A single production possibilities curve "assumes away" the essential problem of the meaning and the determination of marginal costs of water development. Water allocation policy deals with a whole system of cost indifference curves. Which one is relevant can be ascertained only *after* comparing them with a system of "revenue" indifference curves. The optimum point of water allocation then becomes a curve of "optimum direction"—using the terminology of vector analysis.[13] This curve is not monotonic, and under assumptions approaching reality, it is a space curve.

The equidistant feature of the single possibilities curve implies that changes in the water use vector have no influence upon production possibilities. By this implication, one "assumes away" another essential problem of water allocation. This problem is created by great differences in water quality requirements among water uses. This problem presents itself in economic terms through important relations among quality, quantity, and costs.

One must conclude, therefore, that a single equidistant production possibilities curve has no meaning for policy decisions regarding water allocation—whatever its use may be in farm management decisions. Questionable didactical advantages cannot compensate for the conceptual oversimplification.

A similar conclusion holds for the satisfaction indifference system. Social satisfaction indifference curves imply that the problem of comparing and aggregating individual utilities has been solved. Calling a higher indifference curve "Pareto better" does not make it so through word magic.[14] By using the terminology of the "new"[15] welfare economics with-

[13] *Ibid.*, p. 794.

[14] Such use of the word "Pareto-better" occurs in Earl O. Heady, "Basic Logic in Farm and Home Planning," *Journal of Farm Economics*, Vol. XXXVIII, No. 1, February, 1956. In this case, the social group to which the satisfaction indifference

out mentioning its theoretical and practical difficulties, one implies that a criterion for maximizing social satisfaction has been developed that can actually be used for policy. This implication is not warranted by the state of welfare economics.

The contribution of welfare economics has been a clarification of the conceptual meaning (or absence of it) of a social welfare function and social indifference curves and of the difficulties (or impossibility) of applying the Pareto criterion in actuality.[16] The disservice of welfare economics has been that its terminology is used by economists and others without pointing out these theoretical and practical difficulties. The false impression is created that a simple criterion is available that can be used for legislation, court decisions, administrative regulation, and social planning in general.

The questions raised so far with respect to the relations of firm economics and policy economics are overshadowed in their implications by another: Is it conceptually useful to assume "maximization of social satisfaction" as an objective of policy in a world where change over time and uncertainty are the central problems? I shall return to this question presently (Section 6).

5. *Policy Criteria and Welfare Economics*

The title of my original assignment contained the word "welfare" instead of "policy." There is imposed, therefore, an obligation not to evade the welfare issue in policy considerations. Furthermore, what has just been said about the state of welfare economics requires support.

In formulating policy criteria, welfare economics takes explicit account of differences in individual preferences and incomes and of the problems in aggregating individual utilities resulting from the axiom that the marginal utility of individual income decreases with increasing income. There is no agreement on whether and in what sense—ordinally or cardinally—individual utilities can be compared; but one may assume agreement that it is preferable in economics to avoid such comparisons.

Classical and neoclassical economists were well aware of these problems.[17] They, however, focused on an increase of real aggregate national

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curves apply is the farm family, and on the two axes of the indifference diagram are plotted money profits and extramarket goods. The Pareto criterion, of course, has no specific relation to the problem of market versus extramarket goods, but is involved in all choices considering group welfare.

[15] The essential problems of welfare economics were recognized and its relevant theorems developed in the 1890's by Pareto. The term "new" refers to the development in England and the United States since the 1930's.

[16] For the last (but probably not final) word in this clarification, see Paul A. Samuelson, "Social Indifference Curves," *Quarterly Journal of Economics*, Vol. LXX, February, 1956, pp. 1-22. This article cites the significant previous literature.

[17] The first edition of Alfred Marshall's *Principles of Economics* appeared in 1890,

income as the main criterion of economic welfare.[18] Pareto's views were not in conflict with this emphasis because he believed—supported by historical evidence as he saw it—that an increase of national income and greater equality of income distribution tended to be associated.[19] In this case, an increase of national income means also an increase of economic welfare according to Pareto's criterion, at least under some generally accepted assumptions.

The positive correlation between changes of national income and of equality of income distribution—sometimes called "Pareto's law"—was challenged by Pigou[20] and others; but Pareto's welfare criterion is independent of his "law." This does not imply that the correlation noted by Pareto does not exist nor that Pareto's criterion is of greater significance for economic theory than his "law." Quite the contrary, one may wonder whether the great intellectual effort of the last twenty years that has been invested in developing Pareto's criterion might not have yielded greater dividends, in terms of knowledge as well as welfare, if it had been employed for further investigation of Pareto's law and of the problems associated with the increase of national income.

The Pareto criterion, as you all know, says a change that makes at least one individual better off and leaves no individual worse off represents an increase of welfare. This criterion is usually interpreted to mean that welfare is increased by a change rendering it "possible" to make at least one individual better off and leave no individual worse off by compensating the losers. Most of the discussion in the new welfare economics deals with this compensation principle.

The Pareto criterion "without" compensation is so restrictive that it has little relevance for an appraisal of policies—even if it could be practically applied. There are scarcely any policies that make nobody worse off. Furthermore, if there were such policies, the criterion would be ineffective for choosing among more than one alternative to the status quo. The Pareto criterion "with" compensation is not so restrictive, but its application is even less practical.

The Pareto "with" criterion is of course conceptually not identical with the criterion "increase of national income." But the latter criterion may

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seven years before publication of Pareto's main work in French. Marshall mentions Pareto only in passing and in a different connection.

[18] When comparing national income at different points in time and for different countries, per capita figures are used. In appraising alternative policies, it is more useful to focus on aggregate income.

[19] Vilfredo Pareto, *Cours d'Economique Politique* (Lousanne: F. Rouge, Librairie-Editeur, 1897).

[20] A. C. Pigou, *The Economics of Welfare* (London: Macmillan and Company, Limited, 1938).

be regarded as a practical first approximation to the former, provided that the policy under consideration does not appreciably increase inequality of income distribution; and provided further that there are other policies in operation that work independently and continually in the direction of greater equality of income distribution. Such policies are, for example, progression in income and property taxes, high inheritance taxes, and "social welfare" legislation in the narrower sense (relating to old age, invalidity, unemployment, minimum wages, and public health, education, and so on). These two conditions can be regarded as fulfilled when considering resource policies in modern western societies.

Accepting an increase of national income as an economic criterion for policies does not imply that application of this criterion faces no theoretical and practical difficulties, or that it is the most useful criterion in time and uncertainty economics.

The quantities of goods and services making up the national income must be evaluated (weighted) in order to be aggregated. The weights used—market prices and unit values derived indirectly from prices and in other ways—are affected by income distribution and by the host of institutions that influence this distribution. Value weights and quantities are also affected by market form. Policies to be appraised may change income distribution and market form. Such an appraisal deals with the future. Over time, individual preferences and technology—both affecting value weights and quantities of national income—change, and these changes are uncertain. Again, policies to be appraised affect these changes. Besides such "structural" changes, there are changes connected with economic fluctuations of various amplitude and duration. These, likewise, are related to the policies to be appraised. These problems are of interest for benefit-cost analysis, input-output studies of the Leontieff type, and other systematic attempts at a quantitative economic appraisal of policy.

Practical approximations to a solution of some of these problems are possible, but only under restrictive assumptions with respect to institutions, preferences, technology, and time periods. The criterion "increase of national income" can be employed in appraising policies of more limited scope, for example, in appraising an individual water development project or in deciding a particular case of controversy in water allocation.[21] But for appraising policies of broader scope, the restrictive assumptions needed for benefit-cost analysis become too burdensome in time and uncertainty economics (Section 6).

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[21] See S. V. Ciriacy-Wantrup, "Benefit-Cost Analysis and Public Resource Development," *Journal of Farm Economics*, Vol. XXXVII, No. 4, November, 1955.

6. Policy Criteria, Time, and Uncertainty

At first sight, it would appear that the significance of time and uncertainty has thoroughly permeated research in agricultural economics. Maximization is always undertaken "over time." Small and large T's appear in most equations. Two time periods are frequently used as axes of indifference diagrams. Expansion path and time shape have become familiar words in graduate seminars. A statistician will find that the word uncertainty occurs with the greatest frequency in journal articles and dissertations. These and other indicators signal considerable progress if compared with the situation twenty years ago when my interest in conservation—essentially a problem of time economics—began.

Still, I may be permitted a slight feeling of skepticism. One part of it is explained, no doubt, by advancing old age. Another reason was implied earlier: There is increasing emphasis on techniques, such as programming, that facilitate numerical determination of optima. There is increasing reliance on the maximization principle even under conditions where it is in danger of becoming dogma.

In time and uncertainty economics, the assumptions of programming are more burdensome.[22] Differentiation between limitational and nonlimitational factors and among definition of processes are more difficult. In time economics, interdependence of decisions about the combination of processes and about the intensity of each process is especially great. An approach to the uncertainty problem by mathematical transformation of probabilities into single-valued expectations is of little use for most decisions involving time.

Policies have consequences over time that cannot be measured quantitatively in such a way that the data can be used in maximization. Frequently, such consequences are among the most significant ones. This, by itself, does not mean that optima could not be determined under restrictions. It means, however, that an increase in the numerical accuracy of determining optima is of little use and actually becomes harmful if it induces greater confidence in such optima.

Some consequences of policies can be appraised in terms of increases of national income (Section 5). Appraisal of others can only be made in terms of direction and, possibly, rate of change. Under such conditions, a comprehensive maximum of social satisfaction has no operational meaning. The Pareto criterion, likewise, is suited only for ascertaining whether or not an increase of social welfare has occurred but not for determining a maximum.

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[22] Some users of programming recognize the special problems created by time and uncertainty, for example, Chester O. McCorkle, Jr., "Linear Programming as a Tool in Farm Management Analysis," *Journal of Farm Economics*, Vol. XXXVII, No. 5, December, 1955.

One may submit that, in time and uncertainty economics, a quite different approach to a policy criterion is conceptually and practically more useful than maximization. For policies of broader scope, at any rate, it is useful to employ as criteria their effects upon significant conditions that facilitate or impede an increase of national income rather than focus on such an increase itself. This approach to policy criteria relies heavily on economic theory but less on maximization. This approach is greatly interested in economic history and in relating one time period to another but not necessarily through increasing the number of variables and equations in mathematical models. This approach is especially suited for natural resources policies and has been discussed in detail elsewhere.[23]

The emphasis of this approach is on minimum standards in resource use rather than on the optimum use; on establishing base levels rather than on locating peaks; on avoiding dead-end streets and on keeping direction rather than on computing the shortest distance; on mobility and adaptability of productive factors rather than on their optimum combination; and, for the example discussed previously (Section 4), on provisions in water law that facilitate changes over time in water allocation rather than on an optimum water allocation at particular times and places.

This approach does not pretend to establish criteria for maximizing social satisfaction. But it offers direction signals for pursuing the public interest turn by turn.

Farm management and production economics are highly significant for this approach. Definition of minimum standards in resource use, information on whether or not—or how far—realization of such standards can be left to private decisions, indication on policies needed to influence such decisions, and identification of the margin between outright public and private control over resources are to a considerable extent problems of research in farm management and production economics. But it is largely positive rather than normative research that is involved.

[23] S. V. Ciriacy-Wantrup, *Resource Conservation: Economics and Policies* (Berkeley: University of California Press, 1952). See especially Chapter 18.

DISCUSSION: A FRAMEWORK FOR FARM MANAGEMENT RESEARCH PROGRAMS IN THE DECADE AHEAD

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One way of evaluating the paper that has just been presented would be to ask the question "what constitutes a research framework for farm management research in the next ten years?" One framework might involve a classification of the tools and techniques available to us and then to con-

sider the problems that can be handled by the available tools. But the danger with such a procedure is that problems that do not fit might be overlooked or crammed into an inappropriate category.

Most people, I believe, would prefer the approach Kehrberg has taken. That is to focus on problems and then select the appropriate tools or, if appropriate tools do not exist, to call for the development of such tools. Such an approach depends on our appraisal of the future. Let us look at what Kehrberg thinks the future holds. He believes:

1. The price-cost squeeze will continue.
2. Technological change will be rapid.
3. Despite technological innovations we will continue to have fluctuations in prices, yields and costs.
4. New techniques will lead to more substitution of capital for labor and we will have larger but fewer farms.
5. Frictions to these adjustments will lead to a malallocation of resources.
6. To the extent these adjustments do not take place, our surplus problem will be aggravated.

I want to comment later on the last point but in the main I doubt if there would be much disagreement with this list by the people in this room. But even if we are able to establish this broad economic picture, we still need some method of classifying problems. Unless we do, we will not know if we have a complete list or if we are selecting for research those problems of the highest priority.

One method of classifying these problems would be by the bodies that make the decisions, classified in the following manner:

1. The individual farm.
2. Program planners and administrators at all levels.
3. Private firms such as private credit institutions that influence either the product or factor markets in agriculture.

The fact that a paper was being given on institutional problems as well as one on policy considerations perhaps prompted Kehrberg to give skimpy treatment to the second and third classifications. They are important to the individual farmer, however, and the way the farmer reacts may well determine the success or failure of the program. Some may argue that this is not farm management research but it is problem research where resource use on the individual farm is important.

As our economy grows, competition for the factors of production will become more and more intense. This will have important farm management implications. We cannot assume these factors will be priced in the market and that our theory will give us the necessary framework. Water, for example, is not, in the main, allocated by price. The time may be approaching when other factors will be removed from the traditional market place. Economists are being asked by lawmakers and administra-

tors for economic criteria to use in making and administering laws. (They have heard economists know something about allocating resources.) With much of our economic theory market oriented, what adaptations need to be made when the market is abolished if our theory is to perform its traditional role of providing hypotheses and serving as a method of analysis?

This increased competition will pose problems for the individual farmer also. As the demand for land for sub-divisions and recreational purposes increases what should the individual farmer do? The opportunity cost of his land is constantly increasing. Should he sell or should he change the use of the land? Has the time arrived when more farmers should give attention to supplying recreation to urban people?

Let us turn now to some of Kehrberg's research proposals. I agree that input-output studies are likely to command considerable attention in the period ahead. As Kehrberg recognizes much important work in this area has been done in recent years. I, for one, hope this important and fundamental work is continued. Nor is it asking too much that the entire multidimensional surface be estimated as well as the variability of its coefficients. Yet we should not be so taken with the derivation of these data that we forget application. Nor should we forget that while we are waiting on experimental data to give us the whole surface and its variability that farmers will be making decisions. One way we can make application is to integrate this material with survey and farm record data as he mentions. The possibilities of this type of research should continue to be investigated.

Under this same heading Kehrberg calls for more research on the adoption of new techniques. I am sure he recognizes this problem is not a simple one. Not only is there the problem of determining the economic feasibility of an innovation on the basis of experimental data but also of estimating how it will work on farms. In addition, to predict the output effect, the rate of adoption must be estimated. We should recognize that these innovations are coming along so rapidly that we probably will not have the entire production surface for some years after many farmers have adopted an innovation. The farmer first jumps to the new production function. He then decides just where he should be on the function. Of course, if we can improve this process, we should do so. Some information when the decision is made is better than more complete information later.

In the world of change we all expect in the next ten years, Kehrberg points out that risk and uncertainty will continue to be important. We hope, however, that risk and uncertainty has come of age to the point where it can be incorporated into our budgeting and programming as well as other research. Possibly we can incorporate it formally into pro-

gramming as illustrated by Babbar, Bishop, Freund, and others.[1] Even if it cannot be incorporated formally, conclusions reached on the basis of budgets and programs should be with the knowledge that the variance of the coefficients used is usually assumed to be zero.

Kehrberg also calls for a more complete theory of decision making that can be depended upon to lead to optimum results when working in a field of imperfect knowledge. Can we ever expect this? When knowledge of the future is imperfect, can there be, by definition, an optimum course of action in the ex ante sense? When only incomplete information is available can we expect complete answers? Our theory gives us a list of precautions that can be taken—flexibility, diversification, etc.—and we need more empirical work on the costs and returns associated with these precautions. And we do need more work on theories of decision making. But it may be possible to expect too much from such theory.

Kehrberg also calls for more research on "returns to scale" taking into account new technology. Although such studies may yield interesting information two other questions probably should be considered concurrently:

1. What is the real shape of the production function in agriculture? Some assumption about its nature must underlie research on returns to scale.
2. What really limits size of farm in American Agriculture? Is it a lack of knowledge regarding returns to scale? I rather doubt that this is the decisive factor in many cases. The correct answer to this question is also important in many linear programming problems. How relevant is a long-run average cost curve in an economy where change is the rule as Kehrberg points out? This is not to detract from these studies but rather to place them in their setting.

Throughout Kehrberg's paper he makes references to "agricultural surpluses" and "our agricultural problem." One section of his paper is devoted to research on "adjustment frictions." No one would deny such research is in order; but I am somewhat less confident than he that surpluses would disappear if these adjustments take place. Would such adjustments increase or decrease production? With free market prices production might decrease eventually, but with price supports does it follow that production will fall? If production does not decline is the "surplus" problem solved? After all, surpluses, in an economic sense, can occur only in a supported market. Kehrberg may have access to research that gives weight to his position; but his conclusion must rest on the assumption of

[1] M. M. Babbar, "Distributions of Solutions of a Set of Linear Equations," *Journal of the American Statistical Association*, No. 5 (1955); C. E. Bishop, "Programming Farm-Nonfarm Allocation of Farm Family Resources," *Journal of Farm Economics*, Volume XXXVIII, May, 1956; and Rudolf J. Freund, "The Introduction of Risk into a Programming Model," *Econometrica*, Volume 24, No. 3, July, 1956.

free markets and/or that the adoption of new techniques will be output depressing. Specifically, it is a bit difficult to understand how lack of capital to install a sprinkler irrigation system is adding to agricultural surpluses, yet this is the conclusion one would draw from his remarks. His reasoning is difficult to follow on this point.

DISCUSSION: INSTITUTIONAL CONSIDERATIONS IN FARM MANAGEMENT IN THE DECADE AHEAD

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Dr. Gallup of Gallup Poll fame found it most difficult to predict election outcomes in the very immediate future. I think if he knew we economists were predicting the changes to be expected in the decade or quarter century ahead he would lay a warning hand on our shoulder and say, "It's a rocky road ahead." But in spite of the needed caution in prediction, we economists persist. We know that future events will grow out of what is now happening. We need the forward look to facilitate these changes through time, both in needed research and in changing the "working rules" of our society.

Dr. Staniforth has chosen to limit his paper to those major changes in which the changing of economic institutions will play an important role.

He is apparently in agreement with John D. Black's prediction of changes in farming in the years ahead. The closing sentence of the paragraph states, "This will mean fewer farmers using more capital to produce more, and getting less for it." This "getting less for it" may mean getting less for the additional product or the total product, Staniforth does not explain. If it also means lower returns to the additional capital invested in agriculture then his credit discussion needs clarification. Loans based on the future productivity of the loan investment would need to be scaled down and the *self interest* of the lender cause him to weigh alternative investment opportunities more carefully before investing in agriculture.

Staniforth sees "that the important basic thread of these changes is that the position of agriculture is changing." To me changes of the same nature in the past and present indicate this trend is a well marked road, not just a thread. Staniforth says this change is due to technology and the will of the people. But the will of the people is so general a term that it gives us little help in evaluating which social forces are more important in initiating this change.

Staniforth states that "this changing position of agriculture will require

major changes in the whole pattern and attitudes of farming in making farm adjustments. . . ." In my opinion, Staniforth is begging the responsibilities of his topic by not pointing out the form and scope of these changes because, it seems to me, the purpose of this paper and the theme of this conference is to point out these expected changes. In this way research may be planned and executed that will facilitate agriculture's needed adjustment both within agriculture and to the total economy.

Staniforth points out four general problem areas where the changing of economic institutions are likely to be an important part of *the solution*. This solution seems to be "to maintain the family income within this changing framework." Certainly the maintenance of family income is important but other goals such as adequate schools, being one's own boss, the primary and secondary group relationships found in rural areas, are also of critical importance. If these were brought into consideration they might largely alter the problem areas considered.[1]

One problem area is the manner in which an expected decrease in the number of farms actually occurs. Staniforth quotes Black's estimate that this decrease in farm numbers will mean a disappearance of about one-half of the existing low-income farms. He adds that adjustment and reorganization of farm size will likely go on at all size levels. It is rather difficult to comment on such a statement. I wish he had gazed more intently into his crystal ball and told his predictions on factory farms, corporation farms, and changes in the family farm itself.

To me another major area needs consideration and discussion. That is the possibilities of collective action by farmers to improve their conditions and to increase their bargaining power in the market place. As the numbers of farmers decline, they will be more market oriented, more sensitive to policies affecting them, have less voting strength due to a smaller percentage of the population, and have a greater interest in specific representation on issues affecting them.

Briefly the other three problem areas are (1) the problem of increasing capital requirements and obtaining control of sufficient resources to achieve an economic unit, (2) the important role of technology in effecting successful changes in farm organization, and (3) increasing demands placed on individual management due to the changing structure of agriculture and the increasing complexity of the individual farm.

Staniforth points out that rigidity of leasing arrangements has greatly reduced the effectiveness of leasing as a "step in the agricultural ladder." Somewhat facetiously it may be pointed out that one has a better chance of reaching the top of the agricultural ladder via the altar and inheritance

[1] See "proceeding of Land Tenure Workshop," Columbia, Missouri, 1956. Final report of work group C.

than climbing it step by step. I certainly agree that present leasing arrangements need to be evaluated and many of them altered.

The problem is still with us that there are many more potential farmers than there are farms to go around. With another million or more farms to be taken out of production the strain increases. These additional human and physical resources must be guided to other areas of productivity.

I might ask why we are so concerned over credit needs of the farmer when we admittedly have too many resources already invested in the agricultural industry. The answer lies perhaps in the nature of the credit extended and the substitution of capital for labor when a lower cost per unit of output may be reached.

Staniforth did not comment on the capital transfer between generations through the equal inheritance institution. This institutional arrangement transfers millions of dollars of capital out of agriculture annually. Neither did he have space to consider long-term credit arrangements that would not be amortized each generation, but only an annual return on the investment would be required.

I thought Staniforth's discussion of the motivation problem among low-income farmers an excellent contribution to this thorny problem.

I view part-time farming as a two-way bridge allowing people to move into and out of agriculture. As a bridge into agriculture it may allow the acquiring of farm skill plus capital accumulation before the decision is made to be a full-time farmer. As a bridge out of agriculture it may allow for developing industrial skills and a gradual shift to the social outlook of the urban community.

Work has been done by the agricultural economist and the rural sociologist on the adoption of technology. I am not sure that I understand the implications of "the importance of the order in which technologies are adopted has also resulted in differential rates of adoption among enterprises."

Under the topic "Other Institutional Considerations," I would like to have had Staniforth comment on the future role of zoning. There is renewed interest in zoning for resource allocation both in rural and urban areas. Another institution that may loom large in the next ten years is social security. Carl Heisig states that the present basis for participation may involve some adjustments in tenure arrangements.[2] He wonders what effect the program will have on capital formation in agriculture? On movement of labor within agriculture and between agriculture and other industries? On making more farms available for younger farmers?

As you will conclude from comments, I have been mentally stimulated

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[2] Paper presented at the Land Tenure Research Workshop at Columbia, Missouri, July 1956, P. 20.

by Staniforth's paper. Frankly, it has raised as many questions in my mind as it has answered. If I were to add a criticism of the total paper it would be that it was not pointed enough. More specific proposals might invite more brickbats of criticism, but contributions to knowledge usually receive such treatment.

DISCUSSION: POLICY CONSIDERATIONS IN FARM MANAGEMENT RESEARCH IN THE DECADE AHEAD

ANDREW VANVIG
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Dr. Wantrup has furnished us with a scholarly presentation and a valuable addition to some of his other excellent work.

I agree with many of his statements, and the main criticism I have is that his discussion is quite philosophical and somewhat abstract. I would like to see him go further and give some consideration to current farm programs as they are used to implement policy. Many of us in farm management research will be largely concerned at this level in the years immediately ahead.

In analyzing farmers' response, Wantrup states that normative research deals with how farmers *should* respond (within the framework of assumptions set up by the researcher) while positive research deals with how farmers actually *do* respond. He goes on to say that the major part of farm management research since World War II has been of the normative type and that it "seeks to determine economic optima and in its extension phase seeks to assist farmers in attaining them." And only recently have studies been undertaken "that focus on understanding the processes and motives of farm management decisions in reality." Further he says "normative farm management research is significant in making adjustments after a policy has been put into effect"—but for setting up a policy, then research dealing with how farmers actually do respond (i.e. positive farm management research) is of greater significance, and he feels that greater emphasis in this area is needed in the years ahead.

Specifically, Wantrup would like farm management researchers to provide aggregative data on farmers' response for use in formulating policy. In a recent article Dr. Schultz, too, points out the failure of recent production economics research to adequately explain the supply of agricultural products. Admittedly, these shortcomings exist and improvements in this area are needed, but I am not so sure they fall solely in the area of farm management research. (I think that other subgroups of agricultural

economics have responsibilities here as well.) This raises the question: what is the role of the farm management research worker? With regard to policy, whom are we seeking to serve? (a) Is it to help farmers and ranchers in our own states? (b) Is it agriculture generally? (c) Is it the nation as a whole? I suppose in some measure we need to be concerned with all of these—although there are wide differences of opinion as to where the emphasis should be. In many states farm management research workers are necessarily concerned with the more immediate practical management problems facing farmers and ranchers.

As I see it, one part of our job is to evaluate and appraise farm programs that are used to carry out policy with respect to their aggregative effects; i.e., to measure and analyze farmers' responses in order to determine what measures and programs are needed to reach public goals. Then, once a program is put into effect—to measure how well it is achieving the desired objectives, such as conservation, shifts in production, control of output, etc.

We need to analyze the effects of current and future programs on resource efficiency, both for the individual farm and in the aggregate. Acreage allotments (e.g. on cotton and wheat) have resulted in imbalances between machines and crop acreages. Severe cutbacks due to controls, often means the farmer's equipment is then under-utilized—particularly for those machines that are used only on a specific crop. The Soil Bank plan can mean further inefficiency in the use of machines, especially on the smaller farms. Other questions, such as to what extent are controls and support prices forcing shifts in the areas where important crops are grown, need to be analyzed.

The other part of our job is—that once we have a program, e.g. the Soil Bank—then how can *we* provide management aids to help the farmer interpret the effect of the new program for his farm unit. It appears to me that farmers are required to spend an increasing amount of time in determining how national policies (which are implemented through federal farm programs) effect the management of their farms. Very often a farmer's decision as to whether or not and to what extent he takes part in a particular program can have a greater effect on his earnings than if he succeeds in obtaining the *precise* optimum regarding some particular farm input. This is especially true for farmers producing those crops for which acreage allotments and price supports are in effect, but it is also true for cattle ranchers and cattle feeders, since they are affected by the supply and support level in effect on feed crops.

Farmers need economic guides outlining management alternatives as soon as these programs are put into effect and not, as so often happens, three or four years later. Research of this type providing direct, useable

management aids can do much to build support for agricultural economic research from farmers in our own states. Much work has already been done in some states, although I feel this is an area where we ought to give more emphasis in the years ahead.

Dr. Wantrup also raises some questions on methodology used in farm management research and its applications.

First of all, he mentions the increasing emphasis on techniques, such as programming, which facilitate the determination of optima for the firm. However, when these same techniques are used for economic decisions involving time and uncertainty he indicates "an increase of numerical accuracy is of little use and in some cases may actually be harmful." I agree there can be dangers in overemphasis of some of the newer techniques. For example, even though an exact optimum solution is calculated, how long does the optimum solution hold? Farm management is a continuous process and changes and adjustments are continually required. When we consider the realities of farming, attaching too much reliance on refinement in technique can mean neglect of the importance of other factors in management. Dr. Brandt at the meetings last summer expressed concern, too, over the attention given to mathematical techniques in methodology possibly at the expense of theory. We must remember that linear programming and other new techniques are extremely useful tools but are not an end in themselves. Even though the methodology is precise, the results are no better than the basic data used, which I might add is true for any technique.

Wantrup also raises some questions with respect to the role of the maximization principle used in normative farm management research. He accepts its use as an efficiency criterion in cost functions and calls its application here "efficiency economics" or "efficiency engineering." But applied as the "assumed over-all objective of individuals or groups of individuals" then he describes the maximization principle as a construct, a scientific fiction, and fears it has become "mere dogma" in economics.

I believe most farm management research workers recognize that farmers have other goals besides maximum returns. The maximization principle, however, has served as a basis for comparing alternatives from which a farmer can choose and to the extent that these goals can be measured and/or quantified a better basis of choice can be realized.

It seems to me that our current farm programs have important welfare implications that require analysis. Many of these programs are set up on the basis of adding to the aggregate income of agriculture—but how about their effects within agriculture? For example, what are the effects of acreage allotments, price support loans, and the Soil Bank on different groups in agriculture? How well do the large farms, the medium farms,

and the small farms fare under current programs? What are the long-run as well as the short-run effects. A clearer appraisal of the effects of these programs is called for if we are to know how well our policy objectives are being met. It may not be the function of research men to establish goals, but they can help show the consequences of alternative courses of action.

Finally, I suspect we can be more effective in our research efforts if we would put a little more emphasis on the forward look to anticipate problems and to have research underway to help provide answers to questions as they arise rather than two or three years later.

CAN WE EXPAND MARKETS FOR FARM PRODUCTS

Chairman: H. C. Trelogan, Agricultural Marketing Service
(Joint Meeting with American Marketing Association)

ECONOMIC BASES FOR MARKET DEVELOPMENT PROGRAMS: THE CASE OF UNITED STATES COTTON

M. K. Horne, Jr.*
National Cotton Council

MARKET development is essentially a matter of competition. In the case of U.S. cotton, we have two broad problems of competition and two broad areas in which they apply. One problem is our competition with other fibers for the fiber market; the other is our competition with the whole range of goods and services for the consumer dollar. We have these problems both on the domestic market and on the export market.

Thus the world in which U.S. cotton competes for markets is divided into four broad sectors:

(1) Its competition with other fibers for the domestic fiber market.
(2) Its competition with other goods and services for the domestic consumer market.
(3) Its competition with other fibers, including foreign-grown cotton, for the foreign fiber market.
(4) Its competition with other goods and services for the foreign consumer market.

The lines demarcating these four areas are sometimes rather vague. In particular there is no sharp line between the functions performed by fibers and by non-fibrous materials. Yet the broad distinction among the four areas of competition should be reasonably apparent.

The competitive position of any commodity, for any market, is determined by three factors: first, its price; second, its desirability, which is based on quality and usefulness, which in turn are subject to improvement through *research*, provided the findings of research are carried into application through the functions of management and capital; and third, the sales effort placed behind it.

If we are really concerned with taking steps to increase the over-all consumption of U.S. cotton, we are confronted with a subject which is just as broad as this introduction implies. It involves the impact made by each of these factors of competition in each of the four areas described. A weakness at any point can offset strength at other points.

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We have here a subject which is quite inexhaustible. The aim of this paper will be to put the whole thing in a better perspective. I must content myself again and again with broad generalizations, covering a multitude of exceptions and qualifications. I shall strive to hit the high points and shun the low ones.

The Record of Recent Years

Our domestic cotton consumption in the crop year just past totaled 9.1 million bales. Exports were about 2.1 million, but this very low figure was accompanied by a reduction of some 1.7 million bales in foreign inventories. This means that the excess of foreign consumption over foreign production last season was about 3.8 million. This latter figure gives a more fundamental picture of our export position than the actual movement of cotton. So in order to have some impression of the present size of our market, we shall say that the domestic portion is 9.1 million bales, the export portion 3.8 million, and the total 12.9 million.

These figures are strikingly similar to our average experience for a number of years past. Over the preceding ten years, domestic consumption averaged 9.2 million, exports 3.9 million, and the total off-take 13.1 million. For the first five of those ten years, domestic consumption averaged 9.0, exports 3.9, and the total 12.9 million.

If we look at the surface of these figures, they may encourage the belief that there is something inherently static about the markets for U.S. cotton. Nothing could be more wrong. We get the superficial appearance of a trendless market because a number of powerful, dynamic trends operating within it have just happened to offset one another down to the present time.

Underlying our cotton's four areas of competition is the strong and buoyant force of economic growth both in this country and generally throughout the world. This includes, of course, the combined effect of increasing populations and of rising per capita incomes. This upward force, in combination with diverse trends in the areas of competition, explains what has happened. In brief it is this:

On the domestic market, since the late 1940's, the economic growth has been offset by the failure of fibers as a whole to retain their share of the consumer dollar. Cotton's competitive position against other fibers has remained relatively stable.

On the export market, in contrast, the economic growth has been offset by the failure of U.S. cotton to hold its competitive position against foreign-produced fibers for the rapidly expanding foreign fiber market. In this case, the competitive position of all fibers for the consumer dollar has been relatively stable (though individual countries provide conspicuous exceptions).

Our strength has come from economic growth all over the world.

Our best competitive showing has been against other fibers for the domestic fiber market and against other goods and services for the foreign consumer dollar.

Our main weakness has been in competing with foreign fibers for the foreign market and with other goods and services for the domestic market.

It would be foolish to assume that we shall have in the future just the balance of offsetting trends which we have had in the past. Leaving economic growth aside, we face the serious possibility of changes, for better or for worse, in each of the four areas of competition, depending upon what we or our competitors do with the factors of price, research, and promotion.

Price as a Competitive Factor

The significance of price is anything but simple. I would refer you to the recent publication, ***Price and the Future of U.S. Cotton,*** which some of my colleagues and I have prepared. In this paper, I shall keep my comments on price as brief as possible in order to reserve some time for research and promotion. I have reference here to the price of raw cotton. Later something will be said about reducing the margins between this and the retail prices of cotton products.

The significance of price is concentrated very largely within two of the four areas of competition just described. These are the areas in which cotton competes with other fibers for the total fiber market. One of these areas is the domestic, the other is the foreign. The raw cotton price is of relatively small importance in competing for the whole consumer dollar either domestically or abroad. This is because, at the level where the final consumer makes his decisions, the price that counts is the retail price of manufactured products. In this country the cost of the raw cotton in the average apparel or homefurnishings article at the retail level accounts for about 13 per cent of the retail price. Adjusting the price of cotton, in the hope that enough adjustments would be reflected on through to the retail level to influence the volume of purchases, would obviously be a losing game from the viewpoint of the farmer.

In the foreign world the situation may be somewhat different. In some countries the relative margin between the raw cotton and the retail price may be even greater than in the United States, but in others it seems that this relative margin must be, on average, much lower. This is primarily because, especially in the lower income countries, a great percentage of the retail purchases is in the form of piece goods, not fabricated articles, and the piece goods may be of relatively cheap construction. Thus it is somewhat more conceivable that a lower cotton price would affect the

total volume of retail textile purchases in the foreign world than in the United States. This subject needs, and is going to receive, a good deal of further study.

In inter-fiber competition, our recent study brings out the reasons why the *short-run* results of a lower price would not be very impressive. At a given stage of technological development, the spinners and weavers simply do not switch rapidly from one fiber to another on the basis of short-run shifts in relative prices. There are exceptions, of course. The most interesting exception would seem to be the case of the spinner who blends a fraction of rayon with cotton purely for the purpose of lowering his cost. A substantially lower price for cotton might cause him to return rather promptly to the all-cotton product, provided the price of rayon is not reduced commensurately—but past experiences indicates that such reductions usually do occur. In so far as rayon-cotton blends do provide a significant case of short-term elasticity, it is more important in Western Europe and Japan than in the United States, simply because such blending is practiced on a bigger scale in those areas. It seems to be a subject of increasing interest, however, both here and throughout the world.

The primary importance of a lower price in improving our competitive position against other fibers rests upon the following two considerations:

First, it would encourage the spinners, weavers and other manufacturers to take a more favorable attitude toward cotton in all their long-range policies involving such matters as research and machinery investment, out of which real shifts from one fiber to another do emerge. In this respect, short-term price fluctuations are more likely to harm cotton's position than to improve it. What counts is the prevailing impression as to how the price of cotton will compare with that of rayon and other fibers for some years ahead.

Second, a lower price would discourage the producers of competing fibers in their long-range programs of expansion. This applies to the construction of new rayon plant capacity both in this country and abroad. It applies to the many programs, both governmental and private, out of which has come the rapid expansion in foreign production of cotton.

The special case of foreign cotton production requires at least a word of further consideration. In programs of research and promotion, designed to expand the foreign consumption of cotton, it is largely impractical to try to confine the benefits to United States cotton. The superior qualities, the superior merchandising, and the greater emphasis on quality improvement in U.S. cotton can be emphasized in some ways to good advantage. But for the most part, research and promotion programs are of common benefit to foreign cotton along with our own. Therefore, in our competition with foreign cotton for the foreign market, our primary reliance has

to be upon price. And the only fundamentally important way in which price can help us against foreign cotton is by causing the future production of such cotton to be less than it otherwise would be.

Summing up on price, I would like to emphasize two points:

First, the genuine effects of a lower price in bolstering the consumption of U.S. cotton would be the long-range effects—i.e., the effects to be expected after several years. If we recongize that an effective price policy would be one aimed essentially at long-term results, just as effective research and promotion policies are aimed, we shall have crossed an important obstacle to the building of a sound over-all strategy for market development.

Second, in seeking the significance of a lower price, we must know the general areas of competition in which to look for it. The four areas are listed below in the order of the importance of price. The range is from very important in the first area, to unimportant in the fourth: (1) our competition with other fibers for the foreign fiber market; (2) our competition with other fibers for the domestic fiber market; (3) our competition with other goods and services for the foreign consumer dollar; (4) our competition with other goods and services for the domestic consumer dollar.

Research and Promotion

We turn now to research and promotion, and I shall treat these two factors together because they are really joint and inseparable enterprises with the common goal of lifting the demand for a product. When we think of the significance of price changes, we are concerned with where the respective prices would fall upon a given supply and demand scale, or upon a series of supply and demand scales phased out through time. When we think of the significance of research and promotion, we are concerned with moving the whole demand scale to the right, so that more of the product would be purchased at any given price.

A realistic program of research and promotion brings the scientist, the market researcher, and the promotion man together on the same team. They are concerned with one objective, and each man has something to contribute on every phase of the job. For all the end uses of cotton, as of any commodity, these steps are involved:

(1) Analyzing the size of each market, the underlying forces that will make it grow or decline, the fraction of the market held by cotton and the tendency of that fraction to increase or diminish, and the reasons (of quality, price, or psychology) for cotton's present position in that market.

(2) Analyzing the potentials for expanding the consumption of cotton (a) by promoting the consumer appeals to be found in the cotton product

as it is, or (b) by building a new basis for consumer appeals through research aimed at a better product.

(3) Forming a judgment as to what research and what promotion, devoted to what end-use markets, holds the best promise of increasing the consumption of cotton.

(4) Executing the programs decided upon, while remaining alert for new developments requiring a new appraisal of the whole situation.

For commodities which are essentially industrial, such as synthetic fibers, a program such as this can all be carried on within a single corporate management. For agricultural commodities, such as cotton, a balanced program requires the cooperation of numerous agencies.

What is cotton's competitive position in the broad field of research and promotion? I have made a crude estimate that the total annual expenditure upon synthetic fibers research by the main producers of such fibers in this country is now approximately $60 million. In contrast, the expediture upon every phase of cotton research, by all public and private agencies combined, is somewhere around $14 million. (These figures include research aimed at lower production costs, as well as improving the usefulness of the products; but they are roughly indicative of the disparity against cotton in both of these respects.) The total expenditure by the producers of synthetic fibers upon the sales promotion of these fibers is probably about $12 million dollars a year. The chief expenditure of this nature financed even partly by the producers of cotton is that of the National Cotton Council, costing around half a million a year.

In the foreign world the disparity against cotton is undoubtedly greater in both research and promotion. Some of the biggest and most progressive rayon manufacturers are in foreign countries, whereas the foreign cotton world is generally quite far behind this country both in research and in sales promotion. Some most interesting progress is now being made in other countries, but my time limit will permit no discussion of this. I shall have to limit myself, in fact, to the domestic situation throughout the discussion of research and promotion, although the subject is fully as important in the foreign as in the domestic field.

Cotton's disadvantage in available funds is modified by other considerations. One is the inherent merit of the fiber. Another is its natural responsiveness even to limited amounts of research and promotion. Another is the ingenuity with which the limited funds have been used.

We have noted a big disparity against cotton in the funds available to it for research and promotion aimed at competition with other fibers. Likewise there is a big disparity against all fibers combined in the research and promotion funds available to them in their competition for the consumer dollar. For cotton and the synthetics combined, we have

noted an annual expenditure of $74 million on research and of $12½ million on promotion. These seem like large sums until we note the further fact that the total research expenditure in this nation is now about $4½ billions annually, and the total advertising nearly $10 billions. Obviously the portion devoted to fibers as a whole is too small, although the figures that we have on this point are far from complete. This further comparison, however, is noteworthy: In the survey conducted as of January 1952 by the Department of Defense and the Department of Labor, in which about 85 per cent of the nation's industrial research was covered, the textile mill products and apparel industries were found to employ about 4/5 of one per cent of the research engineers and scientists employed by American industry. They employed 15 per cent of industry's workers, but less than one per cent of its research engineers and scientists!

Are research and promotion very important in the contest that cotton wages with other fibers for the fiber market? The answer to this can be clear and sharp. It is *yes*. Although cotton has held a domestic market of about 9 million bales since the late 1940's, the composition of that market has changed radically. The competitive gains or losses are evident in the great majority of the 418 end uses on which the Cotton Council maintains statistics, and all these gains or losses have been influenced significantly, most of them primarily, by research and promotion. The most conspicuous loss has been in tire cord, where research produced a rayon product that took the market. The most conspicuous gain has been in women's outergarments, where research and promotion have resulted in better fabrics, better finishes, better styling, and a fashion trend to cotton.

Cotton's prospects for the future in this inter-fiber competition could be vastly improved if the disparity against it in research and promotion were corrected. On the physical nature of the fibers, or on the methods by which they are produced, there is no logic in treating cotton like a fiber that should receive relatively little research and promotion. Perhaps this is more obvious in promotion than in research. But if we consider where the synthetic industry is spending its research money, it is apparent that a great part of it goes into problems of spinning, weaving, finishing and fabrication which are just as real and urgent for cotton as for any other fiber. It is argued that the synthetics need more research because they get their basic qualities through the magic of chemistry; but the cotton fiber gets its basic qualities through the magic of genetics, plus plant physiology, plus mechanical engineering, plus many other fields of scientific research including, by the way, chemistry.

Now then, are research and promotion very important to cotton in its contest for a share of the consumer dollar? Again the answer is *yes*, but here the case is more complex and arguable.

Cotton (like other agricultural commodities) has long been afflicted by an attitude of fatalism regarding its ability to compete for the consumer dollar. This goes back at least to Ernst Engel, who seemed to feel that the proportion of income expended upon various groups of consumer goods at various levels of income was a matter of economic law. The widely held view today is this: that at the lower levels of per capita income an increase of income brings a proportionate or more-than-proportionate increase in fiber consumption, while at the higher levels an increase of income brings a relatively small increase in fiber consumption. This proposition has been applied to countries of different income levels by the very able economists of Courtaulds, Ltd., the great British rayon firm. They have estimated that the average "income elasticity of demand" for fibers will range from a low of .7 in the United States and Canada, .75 in the United Kingdom, and .9 in Western Europe, to a high of 1.25 on the Asian continent. They put the average "income elasticity of demand" for fibers in the whole world at .85; in other words, a 10 per cent rise in income would tend to bring an 8½ per cent rise in fiber consumption.

There is little room for doubt that some such *tendency* as this does exist, but like many 19th century ideas it can be rudely upset by the mighty force of 20th century technology and promotion.

The recent history of the United States is quite instructive. From the late 1930's to the late 1940's, the big increase in per capita real spending in this country was accompanied by an equally impressive increase in fiber consumption. Per capita textile fiber consumption rose in full proportion to the increase in real consumer spending: from 34.8 pounds in 1939 to 43.6 pounds in 1948. Mind you, by the terminal year of this period, 1948, the war-time backlogs of demand for textiles had already been filled and the shortages of other consumer goods had been greatly relieved. Yet from 1948 forward, per capita fiber consumption has failed entirely to advance with the further rise in consumer spending. It has, in fact, declined. From 1948 through 1955 it declined by 7 per cent. From 1939 to 1948 our "income elasticity of demand" was about 1.0, but from 1948 to 1955 it was about 0.0. What made the difference?

I am not inclined to assign it all to one cause. A number of social and institutional changes have been involved, but we must recognize the magnitude of what has happened in promotion and research. Between 1946 and the present time, the total expenditure on research in this country has risen from less than 2 billion dollars a year to about 4½ billion a year. There has been as much money spent on research in this country during the past six years as in all its previous history. Across this same period, the total advertising expenditures have risen from 3.4 bil-

lions a year to 9 or 10 billions. The effects of this revolutionary expansion can be seen wherever we turn. We all have had many personal experiences with the way this market development effort has brought out new products, new services, new gadgets, new features, new colors, new looks, and has made the consumer want them whether they were foolish or not. Between 1948 and 1955, while consumer spending on clothing in this country was able to rise only from 16.5 to 16.8 billions of dollars, expenditures on automobiles rose from 5.6 to 14.4 billions!

As incomes have risen, and people have faced choices as to where they should place spending power that they did not have before, textiles as a whole have failed to get the new business. Other products, backed by greater programs of research and promotion, have zoomed forward. Indeed they have competed so hard for the consumer dollar that the average American finds he has less money left for textiles today than he had in the 1940's.

Has this been an inevitable experience, which could not have been avoided in any substantial degree if fibers had measured up to metal products in promotion and research? Is it inevitable for the future? Is it due to the very nature of the demand for fibers? I do not think so.

Although cotton is an agricultural commodity, like food, there is no theoretical limit on the amount of it a person can consume, as there is in the case of food. In fibers, as in metals, a human being can adapt himself to an indefinitely small or an indefinitely large volume of consumption. At a given income level, above that of bare subsistence, the volume of fiber products consumed, like the volume of hard goods consumed, depends upon the relative amount of desire built up in the mind of the consumer.

Ed Lipscomb, sales promotion director of the National Cotton Council, said recently:

"Why does a well-to-do woman want a 1956 model car? Does she actually need better quality of transportation than she is getting from last year's model? Does she need it for cheaper transportation? By no means. She wants the satisfaction of keeping up with or getting ahead of the neighbors. She wants the food for ego, the self-esteem, the atmosphere of success that goes with a new model. There are not a handful of people in this country who need a new car every year, or even every two or three years—yet we sold more new cars last year than we did new overcoats."

He is bringing out the fact that the basic policies which sell an ever expanding volume of automobiles could just as logically sell an ever expanding volume of textiles. Textiles lend themselves beautifully to new ideas of comfort, ease, freshness, luxury, novelty, "gadgetry," color, styling, fashion, and above all, the flattery of one's ego. If the average American owned twice his present amount of clothing and homefurnishings, it would not crowd his closets nearly so much as our millions of

over-sized latest-model automobiles are crowding our garages and our streets.

The reason for cotton's failure to protect its share of the consumer dollar is not to be found in the nature of the fiber or of its markets. Rather it is to be found in the fact that the total effort is inadequate. There have been many excellent achievements for cotton in the fields of demand-building research and promotion. Yet the verdict of the market is that these efforts have been too small.

The Problem of Organization

Why is the total investment in cotton research and promotion so inadequate? In the case of the cotton producers, the answer should be obvious: As individuals they are too numerous and too small. But there is the more difficult question: Why do not the manufacturers of cotton products build a research and promotional program of adequate size? Since they can process either cotton or the synthetics, they are not vitally concerned with inter-fiber competition; but they are indeed vitally concerned with protecting the textile share of the consumer dollar.

I will venture an opinion that the basic explanation is in the organization of the whole fiber and textile economy. By and large, this segment of the world's economy tends to be highly competitive. Within the United States particularly, if we think of the system through which cotton is grown, ginned, merchandised, spun, woven, knitted, finished and dyed, fabricated into final products, and distributed to the final consumers, it is on the whole a decidedly more competitive system than that which serves most of the hard goods segments of the economy. While there has been some integration, it remains one of the least integrated segments of the economy, both horizontally and vertically. It is characterized by a number of separately managed stages of processing and merchandising and by a large number of separate managements within each stage. Moreover the individual firms have not been particularly successful in differentiating their products so as to limit the impact of competition.

In an industry having these characteristics, it would seem natural and logical that each management should concern itself very largely with defending and expanding its share of an existing market, and very little with expanding the size of the total market. The incentive of the individual firm to expand the total market is quite limited so long as the benefits of such effort will be spread out among a great many other firms. It seems logical that a firm operating in this situation would emphasize price competition and economy of operation, and would show considerable restraint in matters of research and promotion. Of course this is no more than a broad generalization as to the whole industry.

It is proper to ask: Where do the synthetic fiber manufacturers fit in this picture? They are relatively few in number and large in individual size. I would answer that these firms do have progressive policies of research and promotion. It must be recognized, however, that the synthetic fiber industry still occupies only a minority position within the whole fiber market. In this country it still has less than half as much market as cotton. In the foreign world as a whole, it is even farther behind cotton in spite of its gains during recent years. In this situation the synthetic manufacturers are quite logically preoccupied with inter-fiber competition. This is clearly true despite any protestations to the contrary. In inter-fiber competition there still stretches out before them an area of potential conquest offering all the challenge that they can handle for a good many years ahead.

Synthetic fibers are simply not in the logical position to be most concerned with expanding the total market. The fiber in that position is the one that still holds most of the market—namely cotton—and the nature of the cotton economy, from the farm to the finished product, would seem to point strongly to the importance of group effort if an adequate amount of research and promotion is to be obtained.

A brief word as to margins of value added between the raw cotton fiber and the retail product. We have noted that the raw material accounts for about 13 per cent of the retail price, while the processing and distribution accounts for about 87 per cent. If this 87 per cent could be reduced substantially, there is good reason to think that the purchases of cotton articles would increase. This is a subject of great interest to many people. I do not mean to discount its importance. But I would state that an 87 per cent margin between the farmer and the retail customer is not necessarily a bad thing for the farmer. This is much more than the margins prevailing in food items (which have also been troubled with inadequate market expansion) but probably much less than the margins prevailing in many metal products (which have been fabulously successful in expanding their markets).

Undoubtedly the reduction of margins between the farmer and the retail counter is an important subject, but I would say that in the matter of increasing cotton consumption it is not so important as an adequate expansion of research and promotion. In other words, in the system which carries his product all the way to the final consumer, the cotton farmer does not need to see a cheaper job done nearly so much as he needs to see a better job done. Adequate research and promotion would actually have a short-run tendency to add still further to the 87 per cent margin, but they would expand the consumption of cotton—and after all, isn't this what the farmer needs?

Conclusions

My broad conclusions are these: In the strategy by which the markets for U.S. cotton can be defended and advanced, price, research and promotion are all quite essential. There are areas (most notably in our competition with foreign cotton) where our main reliance has to be upon price. There are other areas (most notably in our competition for the domestic consumer dollar) where we must rely almost wholly on research and promotion. In each of the four broad areas of competition an adequate program, making wise use of the three competitive factors, would hold tremendous possibilities for expanding the consumption of U.S. cotton. The importance of price is concentrated largely within the areas of inter-fiber competition: first in the foreign market, and second, in the domestic market. The importance of research and promotion reaches deeply into all four of the areas. The over-towering fact in the whole competitive world of cotton is the inadequate amount of money being spent upon research and promotion, the promise that an adequate investment might achieve wonders (in time), and the certainty that no really sound program can be built without it.

What are the prospects for the consumption of U.S. cotton five, ten or 20 years from now? Of this much I am certain: No projections into the distant future can have any realism unless they deal with the three powerful factors of competition which, together with economic growth, really control the destiny of our markets. Five years from now our export market may be gone entirely and our domestic consumption may be down to 7 or 8 million bales—or our combined export and domestic market may be 20 million. This much difference could turn solely upon what is done in price, in research, and in promotion.

Suppose that we should construct a program that would give our cotton a reasonably strong showing in all four of its broad areas of competition. Suppose that the growth rate in the foreign consumption of cotton and rayon should be maintained at two million bales a year (as it has, on the average, in recent years) and that cotton should share in this growth in proportion to its present share of the foreign rayon-cotton market. Suppose that foreign cotton producers should not be forced back or held at their present level of production, but merely that they should be induced to hold down their *net expansion* to half a million bales a year. Under these circumstances our exports would tend to increase by a million bales a year and to reach 9 millions in five years. Suppose that our domestic population should continue growing by 1.7 per cent annually and our real per capita consumption expenditures by an average of some 3 per cent. Suppose that fiber consumption also rose by 3 per cent per capita and that cotton continued holding its present share of the domestic fiber

market. The domestic consumption of cotton would tend to expand by 400,000 bales a year and would pass 11 million within five years.

Nearly every one would like to see the day when, without a war or any other major crisis, the production and consumption of U.S. cotton could move into equilibrium with one another in the absence of acreage controls. For a good many years this hope was frustrated by the chronic surplus of population on southern farms, with inadequate alternatives either on or off the farms. In more recent years, people have left these farms by the millions, but a revolution in production efficiency has come to take their place—and in some ways we seem to be farther away from the ideal of a freely established equilibrium than we were before. There is nothing in the foreseeable future to suggest that we can achieve and hold that kind of equilibrium through adjustments on the production side of the equation. We cannot do it unless we make the demand as dynamic as our system of production has become. This is altogether possible if we move with a realistic market development program, not of price alone, but of price, research, and promotion all combined.

NEW TECHNIQUES IN CONSUMER PREFERENCE RESEARCH

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DURING the last few years all of us have witnessed an increased interest in expanding the demand for food and fiber. We have seen a rash of studies concerned with many aspects of merchandising, displaying, and packaging of products. There have been surveys of various types to obtain opinions of consumers and users of products and services. Some attempts to study consumer motivation have been made. Much of this work was stimulated by the surplus situation in some products and by the emphasis for research of this type in the RMA Act of 1946.

A review of the results in this broad range of studies indicates that some may be inconclusive; that merchandising implications are at best transitory and hold only for particular situations; that preferences "discovered" for a product of one study may be somewhat different from those "discovered" in another study; and that erroneous interpretations and extrapolations from data have been made. In view of these results, some laymen and market practitioners may hold this work in low esteem. Preference research is unfortunately identified in many minds with a report that 30 percent of consumers preferred (said they preferred or bought) product A, 40 percent B, and 30 percent C. But there is much more to today's consumer preference research than a recital of percentages. Yet, much good work has been done and many workers have recognized the limitations of their work.

The period that we have passed through represents in a sense a maelstrom of effort of many individuals of different disciplines, each attacking the problem from a particular point of view. There were few general guiding principles for empirical work. Economists quite naturally began studies in this area drawing from their tool kit the theory of consumers' demand. Much of the empirical work in the theory of demand was of the aggregate type and aided in developing the general framework of preference studies.[1] However, studies of preference functions of a group or groups of consumers have been rarely attempted and approximations of the preference surface is fraught with many empirical difficulties.

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[1] Frederick V. Waugh, "A Partial Indifference surface for Beef and Pork," *Journal of Farm Economics*, Volume XXXVII, Number 1, February 1956.

This period of methodological maelstrom probably should be viewed as essentially productive. Dr. Conant suggests that work in new fields can make greater progress if the workers are not bound too rigidly by "stand pat" procedure.[2] Techniques and methodology have to be borrowed and adapted to fit the nature of the problem. Some economists may be dismayed that study of preferences finally involves techniques borrowed from fields of food technology, psychology and others. Yet, the methodological contributions of these disciplines are essential to further understanding of the consumer.

Concepts of preference and acceptance by research workers have been understandably diverse. We have found the following definitions useful:

(1) Preference refers to choice or the ordering of choices among two or more alternative products in a given environment by a consumer or group of consumers.
(2) Acceptance refers to the degree of salability of the product in a given market situation.[3]

The guide for interpretation provided by these two concepts may be dramatized by the following example. A commercial testing company found that two-thirds of consumers preferred fish sticks treated with a certain level of Monosodium Glutamate while one-third preferred the untreated sticks. The researchers concluded that the additive "can achieve a two-fold increase at the sales level."[4] This is an erroneous inference of preference results to an acceptance situation. Twice as many consumers indicated a preference for treated as for untreated fish sticks. Consumers did not indicate that they would accept—i.e. buy, twice as many treated fish sticks as they would if untreated. Preferences are related to acceptance but not in the simple direct way sometimes inferred. Moreover, preference research has other goals in addition to sales prediction, some of which will be developed later.

SENSORY EXPERIMENTS

Our work at Missouri since 1951 has been part of the methodological maelstrom. A brief review of this work will reveal the evolving of tech-

[2] J. B. Conant, *On Understanding Science* (New Haven: Yale University Press, 1947).

[3] Quartermaster Corps researchers have used acceptance to mean the extent to which a product is readily consumed by Army personnel. This evaluation of acceptability by hedonic scales in a nonmarket environment has aided army menu planning and product development and should be of considerable interest to economists. Cf. David Peryam and Norman Girardot, "QM Advanced Taste-Test Method," *Food Engineering* 24:59, July 1952; and David R. Peryam, Francis J. Pilgrim, and Martin S. Peterson, editors, *Food Acceptance Testing Methodology* (Chicago: National Academy of Sciences—National Research Council, 1954).

[4] Dean Foster, "Use of MSG at Proper Level Doubles Products' Consumer Acceptance" *Quick Frozen Foods*, XVII, October 1954, pp. 51-52.

niques as work progressed. We believe that discussing the sequence of our studies with beef and that reviewing in retrospect the problems encountered will be useful. The first major study dealt with visual preferences, that is, preferences based on appearance of the product. Visual preferences among four federal grades of steaks of a large sample of St. Louis shoppers were determined in 1954. Among other results, there were two findings that motivated a major change in our methodology. These findings were:

(1) Most visual preferences among grades were greatly different from that anticipated by experts;
(2) Most consumer ideas concerning the relation of visual and eating characteristics differed greatly from expert opinion.

It was concluded that a method of ascertaining *eating* or sensory preferences of consumer must be developed. A search of the literature revealed that two types of sensory preference research had been developed by food technologists, psychologists, and other noneconomists.[5] One type used the household panel. Consumers had been furnished samples of various foods and asked for an evaluation or for preferences.

The other, better known type of sensory preference research utilized the laboratory panel. Here preferences and/or acceptability evaluations had been obtained from a small panel of expert tasters under controlled laboratory conditions. The inference of expert preferences to the great mass of consumers required a heroic assumption about the representativeness of experts. However, the method has often been used because of its convenience and susceptibility to rigid control.[6]

At the outset two prerequisites of efficient preference testing were recognized. They are (1) that all units of the same product actually are homogeneous in the characteristics being tested and (2) that the different products being compared actually are discernibly different in the characteristics being tested. These prerequisites were fairly well satisfied in our previous visual tests by careful selection of federal grades of beef. How-

[5] A few of the better studies include the following: George Garnatz, "But What Do the Consumers Say?," *Food Industries*, 13:39–50; James A. Bayton and Hugh P. Bell, *Preferences for Canned Orange Juices That Vary in Brix-Acid Ratio*, Marketing Research Report No. 76, Washington, 1954; John Nair, "Mass Taste Panels," *Food Technology*, 3:131-36; Marion Simone, *et al.*, "Consumer Studies on Sweetness of Canned Cling Peaches," *Food Technology*, 10:27-82, June, 1956.

[6] The following references are a good introduction to a rapidly growing literature: Elsie Dawson and Betsy Harris, *Sensory Methods for Measuring Differences in Food Quality*, U.S.D.A. Agr. Info. Bul. No. 34, pp. 1-134; M. M. Boggs and H. L. Hanson, "Analysis of Foods by Sensory Difference Tests," *Advances in Food Research*, E. M. Mrak and George F. Stewart, editors (New York: Academic Press, 1949), II, 219-58; Peryam, Pilgrim, and Peterson, *op. cit.*; R. A. Bradley and P. N. Somerville, *Statistical Techniques for Sensory Testing of Processed Foods*, Progress Report No. 1, Department of Statistics, Virginia Polytechnic Institute, 1955.

ever, there was very little evidence to suggest whether or not federal grades or a certain portion of the grades met either prerequisite when used in sensory tests.[7] Therefore, the first problem was not to determine sensory preferences among certain "beef products" or grades. The first problem was, rather, to define those products or grades that could be meaningfully compared to determine sensory preferences. The hypothesis was that eating discrimination among steak samples of two nonadjacent federal carcass grades does not exceed discrimination among samples of the same grade.

The laboratory panel was utilized for preliminary tests of this hypothesis. Experimental controls were very detailed as must be the case in any sensory experiments.[8] Sufficient of the procedures will be described to indicate the general method.

Two panels, each with six members, met separately but tasted parallel samples so that their results could be compared and combined. After some preliminary testing with a few loins and rounds, the main experiments were designed. Loins from 80 steer and heifer carcasses weighing 580 pounds were used, i.e., 20 from the lower third of each of four federal grades. After aging for a prescribed time under controlled conditions, each loin was cut into 12 steaks of ¾ inch thickness. These steaks were frozen, stored, thawed, and cooked to medium-well done under laboratory controls.

In order to test the hypothesis, the experimental design included comparisons *within* and *between* grades. The 20 loins in the Prime grade were randomly paired with the 20 in the Good grade, and the 20 in the Choice grade were randomly paired with the Commercial grade. Six steaks from each loin were used in *between* grade comparisons. The remaining six steaks from each loin were used in the *within* grade comparisons. For the *within* grade comparisons, ten loins in each of the four grades were randomly paired with the other ten loins of that grade. Thus, one-half of each loin was used for *between* grade comparisons and one-half was used for *within* grade comparisons. There was a total of 2,678 individual comparisons.

The trio comparison was the tool used for discrimination. Each panel member was provided three samples and asked to identify the odd one. Two samples were from one loin and the third sample was from the loin randomly paired with it. The 12 steaks available from the paired loins

[7] Amazing as it may seem, beef grades were established without reference to any tests of the eating or visual preferences of consumers.

[8] The control problems are probably greater for meats than for many liquid or comminuted products. The active participation of the University of Missouri meats laboratory staff was essential throughout these studies and was particularly necessary to control in all of the phases of the experiments.

provided two trios for each of the 12 panel members for a total of 24 comparisons. Since one-third of the trios may be expected to be solved correctly by guessing, 13 of the 24 trios must be solved correctly in order to discriminate significantly between a pair of loins at the 5 percent level.

Distinguishable differences *within* grades were found. Panel members distinguished eating differences *within* grades at a significant level between the following:

4 of 10 pairs of Prime loins tested;
3 of 10 pairs of Choice loins tested;
2 of 10 pairs of Good loins tested;
7 of 10 pairs of Commercial loins tested.

Thus, Commercial grade was the most heterogeneous grade in this test. Although there was an apparent lack of eating homogeneity *within* grades, panel members distinguished differences between grades at a significant level as follows:

11 of 20 pairs of Prime and Good loins tested;
7 of 20 pairs of Choice and Commercial loins tested.

Thus, panel members distinguished between less than one-half of the Choice and Commercial pairs of loins in this test. These results might be summarized by asking and answering two questions as follows:

(1) Did loin steaks from different cattle taste alike? Answer: Yes, they often did. Panel members could not tell the difference between 46 of the 80 pairs of loins compared.
(2) Did loin steaks from cattle of the same grade more often taste alike than those from cattle of nonadjoining grades? Answer: No. Panel members distinguished between steaks from 16 of 40 pairs of loins within the same grade and between 18 of 40 pairs of loins on nonadjoining grades.

These results from limited data would indicate that present federal grades do not meet the prerequisites for determining meaningful eating preferences among them.

A large consumer panel was established in late 1955 to test further the original hypothesis. A two-stage probability sample was taken of White households in Metropolitan St. Louis, Mo. A preliminary interview screened out those households lacking two adults willing to cooperate or households with other disqualifying characteristics such as low income, very little education, or very low consumption of beef. Each of the 266 cooperating households received a pair of frozen loin steaks without cost twice a week for three weeks. Each panel member tasted and rated both steaks on a 9-point descriptive hedonic scale. Panel members then indicated a preference, or no preference, between the two steaks. Panel members were asked to cook all the steaks by their customary method and degree of doneness.

The six pairs of steaks provided each household with two replicates of each of the following comparisons: Prime and Good, Choice and Commercial, and Choice and Choice. Replicates of adjoining steaks were provided to test consistency of preferences. It was reasoned that a reversal of preferences between replicates would indicate either a lack of discrimination or no real preference.[9] Either result has much the same implications in the market place or in the construction of grade standards.

Rigid experimental control of the product was maintained from selection through cutting, storing, and delivery to the households. A total of 3,192 steaks from 126 pairs of loins was used in the household experiments.

An incomplete analysis indicates confirmation of the laboratory findings of homogeneity of many loins from nonadjoining grades. However, it appears that the household panel found the Choice grade to be more homogeneous than did the laboratory panel. The eating preference patterns contradict the visual preferences found by various researchers, including ourselves. Many visual preferences have been for the leaner grades at equal prices or even with some price differential against the leaner grade. *Eating* preferences were very rarely for the leaner grades. It seems evident that:

(1) Some loins of a fatter grade were preferred to some loins of a leaner grade at equal prices;
(2) There was consumer indifference between many loins of a learner and a fatter grade at equal prices;
(3) No loins of a leaner grade were preferred to loins of a fatter grade at equal prices.

These results indicate a definite need for a system of consumer grades that will *not* classify "likes" as unlikes" and vice-versa. Again, these results must be considered as very tentative. These results suggest that some sort of premium pricing of the fatter carcasses in the market is justified by the preferences of consumers. If grades can be defined on the basis of consumer preferences, then the marketing mechanism should be able to ascertain the economic outputs and prices of those grades.

Application of Sensory Testing

What generalizations may be made about the usefulness, applicability and limitations of eating or sensory tests? Some specific applications will be discussed before we undertake discussion of general problems and advantages. Three specific uses are as follows:

1. *Grades–assurance of quality repeatability.* The first important field

[9] Vernon Clover, "Measuring Firmness with Which Opinions are Held," *Public Opinion Quarterly*, 14:338-40, 1950; Washington Platt, "Some Fundamental Assumptions Pertaining to the Judgement of Food Flavors," *Food Research*, 2:237-49.

for the application of sensory testing is the determination of product homogeneity. Some progress in quality control has already been made, but much more progress is needed to increase usefulness of grade standards for various food products. Quality repeatability is important to the consumer.

The small laboratory panel provides the grader or processor an efficient and generally satisfactory tool for quality control. What are the problems? First, there are the ordinary laboratory problems of maintaining experimental controls. Although the magnitude of these problems can be easily underestimated by a social scientist, they are not insuperable. Second, there is a problem of interpretation. The goal of grading or quality repeatability should be value homogeneity within a grade or "quality." Something less than sensory homogeneity in a product may still allow value homogeneity in many cases. Sensory homogeneity needs to be recognized as a tool in establishing boundaries and not as a goal in itself. Third, the relationship of laboratory and household panel results is sometimes disappointing.[10] It has been plausibly argued that sensory discrimination tests should yield much more homogeneous results than preference tests.[11] However, differences in threshold levels of discrimination have been demonstrated.[12] Discrimination ability has been shown to be affected by motivation.[13] Therefore, inference of small panel discrimination results must be advanced cautiously at the present stage of methodology.

2. *Design of new products.* The second important field for the application of sensory testing is the design of new food products or the modification of old ones. The "product mix," i.e., the particular combination of ingredients of the product, needs to be determined in relation to consumers' preferences, input costs, nutrition, and regulatory aspects. Regulatory efforts should consider preferences along with attempts to prevent so-called "adulteration." Otherwise, some limits established by regulation on product formulation may tend to become embedded as part of quality standards when in fact these limits may hinder the satisfaction of preferences. Sensory testing can facilitate rational determination of product design. The problem is easy (1) if only the most popular product mix is to be produced, and (2) if that product mix is as cheap as any alternative. A good example is the work of Bayton and Bell with Brix-acid ratios in

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[10] Elsie Raffensperger and Francis J. Pilgrim, "Knowledge of the Stimulus Variable as an Aid in Discrimination Tests," *Food Technology*, 10:254-57.

[11] M. M. Boggs and H. L. Hanson, *op. cit.*, p. 221.

[12] W. D. Baten, "Reaction of Age Groups to Organoleptic Tests," *Food Technology* 4:277-79; B. B. Bohren and Ruth Jordan, "A Technique for Detecting Flavor Changes in Stored Dried Eggs," *Food Research*, 18:583-91, 1953.

[13] Peryam, Pilgrim, and Peterson, *op. cit.*, pp. 4-17.

canned citrus juices.[14] Grapefruit and orange juices of various ratios were given large consumer panels in Indianapolis. Several Brix-acid ratios of sweetened grapefruit juice were quite acceptable but a particular range was found to be most acceptable and was recommended to the industry. The distribution of preferences for orange juice, however, was bimodal and the product most acceptable to some was less acceptable to others. After considering the likes and dislikes of consumers representing the whole market, it was suggested that two product mixes should be marketed. Whether or not the marketing of two juices would be a more efficient operation than marketing only one, depends on distribution costs in relation to preferences.

Again, it might be found that the most acceptable product mix is the most expensive. It may be quite a problem to determine which mix is the most acceptable when relative prices of this nature are introduced into the choice situations. Sales tests probably have the most promise for solving this problem.

3. *Choice among given products.* The third general area for useful application of sensory testing is the determination of preferences and relative acceptance among given products. This area, which was once regarded as the only area for preference research, is a difficult one. The goals generally involve determination of the optimum price relationships and the optimum relative rates of sale among the products on the basis of relative costs and preference patterns. An optimum rate of sale of zero for one or more of the products is possible. These optimal values may then be compared with existing values to check the efficiency of the existing system.

Visual preferences have been determined by sales tests and interviews. Although each method has its proponents, it is becoming obvious that each has its advantages and disadvantages. Trienah Meyers, at last year's meeting, told of the cranberry container case. Sales trends indicated that boxes were gaining in popularity over bags. Sales tests showed that bags sold better. Interviews revealed that consumers really did not care if cranberries were in boxes or in bags.[15]

Preferences for many products may be meaningfully determined on the basis of visual clues only. This is obviously true in the case of most nonfoods and may be demonstrated for some foods. For example, we suspect that the only detectable differences in the eating qualities of

[14] James A. Bayton and Hugh P. Bell, *op. cit.;* Hugh Bell, *Preferences for Canned Grapefruit Juices,* Marketing Research Report No. 108. The Kroger Food Foundation has obtained considerable consumer evaluation of various product mixes. Cf. Garnatz, *op. cit.*

[15] Trienah Meyers, "Predicting Market Acceptance," *Journal of Farm Economics,* 37:1387-94, Dec., 1955.

most pork cuts result from differences in the fat/lean ratio that can be detected visually. On the other hand, sensory tests of preferences appear most relevant for beef, processed meats, manufactured food products, and certain other foods. Optimum consumer satisfaction involves both the eating qualities and the visual characteristics of these products.

GENERAL LIMITATIONS AND ADVANTAGES OF SENSORY TESTS

Sensory testing and its interpretation need many methodological improvements. For example, it has been argued that a product should be sampled alone rather than in comparison with other products. In this instance, a reaction to this "single stimulus" is recorded on a hedonic scale. The close analogy of the single stimulus test to normal home consumption and the favorable results reported with the test indicate that it should be considered for preference testing.[16] However, *discrimination* cannot be measured accurately unless all consumers possess identical preferences.

Various experimental designs and methods of analysis have been used in sensory testing. Two cautions seem to be in order. First, the concept of the average consumer may be misleading. For example, the mean acceptance rating for lamb probably would be very low among average American consumers, but there is still an important market for lamb among a small minority of consumers. Second, statistical significance and practical economic significance are not always synonymous. Small but significant statistical differences may not warrant differentiation in the market place.

The selection of panel members or subjects for sensory experiments is influenced by two opposing forces. A strict concept of consumer representativeness would require a large, randomly selected sample of subjects from the consuming population. Cost and convenience considerations may sensibly be paramount in pretesting but not in the final testing. Furthermore, for many products it is difficult to identify the exactly relevant consumer population. Should a test involving beef steaks include people who are potentially regular consumers but rarely eat them now? Should people with low incomes be excluded from a beefsteak test on the premise that only an insignificant proportion of them can express an effective demand for steaks?[17]

The degree of maintenance of experimental controls of sensory testing in the household is an important problem concerning which we have

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[16] Bayton and Bell, *op. cit.* The influence of comparisons upon evaluation has been demonstrated. Cf. Ernest Lockhart and Jean Gainer, "Acceptance of Fresh, Frozen, Canned Orange Juices," *Food Research*, 14:429-33.

[17] This is a problem common to all preference or acceptance studies.

sparse information. Some preferences are probably affected by visual appraisal. Panel members should be informed of the importance of honest opinions, and schedules should be checked for inconsistencies or for patterns indicating carelessness or cheating. Deliveries of product should be sufficiently infrequent to allow adequate time for convenient household consumption but should be sufficiently frequent to maintain interest.

Sensory testing of the necessary scale to obtain meaningful results is expensive. It is very demanding. Researchers must wrestle with problems of product procurement, handling, and distribution. In many cases, such detailed knowledge of the product is required that the research team must include product specialists and technologists.

Sensory tests as contrasted with sales tests have some advantages for the researcher. They may be planned and executed very quickly as compared with sales tests where involved negotiations with retailers are often necessary. The more important advantage lies in the nature of sensory testing research. It discovers something fundamental about preferences. The discovery of these preferences can be useful to merchandisers, and—even more important—can help satisfy rather than exploit consumers. Commercial researchers too seldom attempt to discover fundamental preferences, although their employers may spend millions of dollars trying to influence these preferences.

FRAMEWORK AND SEQUENCE OF RESEARCH STRATEGY

It is clear, then, that the present status of methodology in this field suggests weaknesses in application and interpretation. This arises in part from the fact that quality standards, product design and product development are complex in nature. We believe that an over-all research strategy is needed. A general research strategy is essential to guide the needed diverse skills, to suggest more clearly the gaps in the work, and to indicate where more integrated efforts on methodology are useful.

The steps or guide might follow this sequence in the case of consumer quality standards and product design research:

1. Discovery of quality factors and the composite of quality factors that have meaning to consumers. This step should recognize the importance of the large differing preference groups and of the no preference groups. Likewise, a product may be quite heterogeneous. The defining of a hemogeneous product is necessary to the meaningful separation of product variation from preference variation. The goal in this step is to obtain major areas of physical product homogeneity on the product surface and to discover important preference groups in terms of these areas of product homogeneity.
2. Discovery of objective and subjective measures that will predict product homogeneous areas. The goal of this step is to discover practicable means of separating the product into homogeneous areas which are defined in terms of

important preference groups. Technological advances in means of separation need to be anticipated and recognized.

3. Formulation and development of quality standards. The previous steps form the foundation on which formulation should be based. They provide a scientific basis for standards which has been lacking in many standards formulated on expert ideas of "what consumers should prefer" or those coinciding with "industry practice."

4. Consideration of the technical and biological requirements and those that are attainable in practice for maintenance of quality in market channels in accordance with adopted quality standards. The problem of changes in quality varies greatly with the product. These considerations are very important for such products as eggs and some fruits and vegetables but are less important for meats.

5. Consideration of the interdependence of preferences, quality standards, production and distribution techniques and costs. The economic goal is that of equating marginal resource substitution to marginal product substitution and satisfactions. The adoption of a quality standard will likely involve adjustments in both factor and product substitution. A continuing analysis of the forces underlying changes in preferences is an essential part of this step. Explicit recognition must be given to the fact that preferences are determined by the whole environment and not entirely by physiological criteria. Therefore, changes in production techniques, social attitudes and economic factors are all likely to influence and alter preferences.

These are the conceptual steps. Each step involves an integration of disciplines and a discovery of gaps within each step. This is merely suggestive as to possibilities of integration and of a strategy that focuses attention on the sequential steps. Greater progress is likely possible by adopting this type of operations research approach.

The most promising methodological improvement in the near future is a team approach that systematically discovers and remedies gaps in our knowledge. Probably a primary cause of the deficiency of answers in this field is the fact that questions have been confined within disciplines. Therefore, some of the really relevant questions have not been asked. Answers to these questions remain for the future.

RESEARCH ON IMPROVED MERCHANDISING OF AGRICULTURAL PRODUCTS*

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MERCHANDISING is a term of many meanings. Agreement is rather universal with regard to its general connotations, yet few would agree on a precise definition. In a broad sense, merchandising refers to a complex of decisions and subsequent actions relating to market promotion. It encompasses such basic activities as the selection of agencies to be employed in the marketing process, the formulation of a promotional approach, and decisions regarding the sizes, types and assortments of sales units to be used.

More frequently, however, merchandising is a term used to describe the various types of activity within a single retail store. Yet, even within the business framework of a retail store some confusion and controversy exists with respect to the scope of merchandising. To some, the term implies the full range of retailing operations. Others take the more limited view that merchandising is concerned with matters directly related to selling.

In an area with the breadth, complexity, and vagueness of merchandising, it is apparent that all aspects of research methodology cannot be covered. Since the research emphasis of the past few years has been on merchandising from the standpoint of food retailing, it is this segment of the general problem that will be examined.

Agricultural marketing research concerned with the operations of food retailing firms may logically be divided into two economic categories: (1) research directed toward improving the efficiency with which the retailing function is performed, and (2) research aimed at increasing the sales of individual products or closely related groups of products. Both of these have income implications from the standpoint of the retailer and of the agricultural producer.

For purposes of this paper, merchandising shall be regarded as the category of activities relating to sales promotion. It is within this area that most merchandising research in the field of food retailing has been concentrated. The interest of researchers has been focused upon developing operational schemes that will increase sales. In this paper, emphasis will

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be placed upon the development of guideposts of research methodology that may aid researchers in achieving this end.

In light of the evident concentration upon selling in the practical application of merchandising methods, it is understandable why this approach has great intuitive appeal to research workers. However, it is important to recognize at the outset that the implementation of sales promotional techniques cannot be accomplished independently of considerations involving operational efficiency, even though the latter may be regarded as a separate area of research activity.

Compared to a few years ago, the retail store management of today has access to a wealth of research information designed to aid in the development of better merchandising techniques. From available research publications, an imposing list of specific suggestions for the improvement of retail merchandising methods can be compiled. Many, but not all, of these suggestions have been enthusiastically received and applied by the retailer.

The nature and amount of recent activity is ample testimony that we have begun to move in the field of merchandising research. However, when consideration is given to the host of agricultural products handled by the retail store operator, and the numerous facets of merchandising activity, it is apparent that much remains to be done. The array of problems confronting the merchandising researcher and the interest shown in past merchandising research suggest that the future will bring a considerable intensification of effort in this field. Consequently, at this stage of events it seems appropriate to consider the matter of an efficient approach to merchandising research. The time has come to think in terms of developing a set of principles that will aid the researcher in marshalling his resources and organizing his attack on retail merchandising problems.

Elements of the Approach to Merchandising Research

Effective merchandising research involves the development of a systematic and a sequential method of attack on problems confronting retailers or agricultural producers. The contention of the writer is that there are three elements of this attack, all of which are essential to the search for results that can be effectively applied at the retail level: (a) the identification of the problem, (b) the testing of likely merchandising alternatives, and (c) the evaluation of test results from the standpoint of application. The merchandising researcher should reckon fully with each of these elements. The matters of identification and application are not appendages to the orthodox research approach involving the testing of merchandising alternatives. Rather, they are an integral and, in fact, equally important part of the total process.

Identification of the important aspects of the problem

The essential initial step in attacking merchandising problems is the accumulation of background information and an appraisal of the situation. This is not a prelude to the attack, but a vitally important part of it. Methods of developing better relations with the consumer may stem from multifarious sources. Many of these become apparent only after a painstaking examination of the numerous facets of existing market setting. In connection with this initial step, extensive use may be made of available relevant information, but in some instances additional investigations will be required.

A prerequisite to the development of an effective program of market research activity directed at merchandising problems is a full knowledge of the uses, opinions, and attitudes of consumers regarding the item in question. Since the source of the problem is hidden among the vagaries of consumer behavior, the search for the solution should start there as well.

A consumer survey can be used to advantage in identifying certain aspects of the merchandising problem that deserve additional examination. The purchase and use patterns of consumers may provide a basis for the selection of an assortment of package types or pricing units to be subjected to closer scrutiny in market tests. The impressions and opinions of consumers may be employed to determine the methods, types and sizes of displays having the greatest potential appeal.

Consumers can make a real contribution to the researcher in connection with those aspects of merchandising relating to product differentiation. A survey can disclose the basic attributes of quality that concern and have potential value to the consumer. Such information will constitute the background for the development of studies to establish the criteria that should be employed to measure quality differences and to determine their economic significance.

The knowledge and opinions of homemakers can be employed in the development of promotional research approaches. If a large proportion have had little experience with the product or possess only a limited knowledge of its uses and characteristics, emphasis may be placed upon educational techniques. If most are infrequent users, methods of suggesting new uses may be examined. If many use the product frequently but at a low rate, nutritional or emotional appeals may be tried.

One could continue at some length examining the capacity of the consumer survey to identify important aspects of the merchandising problem. The foregoing should be sufficient to illustrate its advantages as a part of the initial phase of the research investigation. In varying degrees, we are aware of how consumers use specific products, what they regard as

quality differences, the customary units in which they buy, and other information useful in the development of better merchandising methods. However, we cannot know individually as much as consumers do collectively about these matters. The consumer survey may seldom furnish answers to the merchandising problem, but it can materially increase the efficiency of the search for them.

Not all merchandising research need begin with the survey approach. A considerable amount, and, in some cases, a sufficient quantity of background material of this nature has been accumulated in studies of the past. However, the researcher should not be deterred from supplementing such efforts because of declining vogue of the consumer survey if examination reveals that relevant information is missing.

The consumer survey is only one phase of the process of accumulating background information for the purpose of assessing the situation. A considerable volume of pertinent material is likely to be found in available statistical series and in published research reports. Descriptive studies of retailing operations should be reviewed to establish the role that the product in question occupies in the total store operation. These will also reveal much useful information regarding handling costs, spoilage losses, turnover rates, and retailing margins that may aid in locating the fundamental merchandising problems. Consumption statistics can be used to investigate shifts in the consumption pattern that favorably, or adversely, affect the product under consideration. Panel data may reveal that the consumption of the product is declining in segments of the population identifiable in terms of age, family characteristics, income, ancestry, or religion.

The results of previous merchandising research studies are especially important sources of information concerning the relative merits of different types of market tests and the methodological experiences of other researchers. The full array of information sources should be examined to assure the accumulation and inclusion of all pertinent facts in the evaluation and problem identification process.

The process of identifying merchandising problems in itself clearly requires substantial effort. This may partially explain why many research workers in the past have proceeded directly with the study of alternative merchandising methods without bothering to isolate or identify adequately the crucial aspects of the problem. In view of the vast range of merchandising alternatives and the innumerable combinations in which they may be applied, the efficiency of this procedure is highly questionable. Although the results may well provide the basis for selection of one from among the number of alternatives tested, they provide insufficient assurance that the ones having greatest potential sales appeal were included.

The reward for devoting effort and resources to problem identification is a well oriented, more efficient research program.

The testing of alternatives

The collection and evaluation of information obtained from consumer surveys and other sources set the stage for a more objective examination of alternative merchandising techniques. Out of the facts, opinions and relationships thus obtained, sets of merchandising practices can be developed that lend themselves to testing in the retail situation. If the preliminary research phase of problem identification is thoroughly conducted, the market tests will include only the most promising alternatives.

The market test may take any of several forms. The evaluation of different methods that may be employed represents a subject within itself and is beyond the scope of this paper. Experiments of varying degrees of elegance can be devised to evaluate a set of merchandising practices ranging up to a practical limit of 5 or 6 alternatives.[1]

Some problems will entail a sequence of market tests. For example, the examination of background information may lead to the hypothesis that consumers have varying preferences relating to the shape of avocados. A market test involving matched lots may be required to substantiate or refute this assumption. If consumers did, in fact, demonstrate decided preferences for certain fruit shapes, additional tests would be required to translate these preferences into monetary terms. Still further work may be required to ascertain the possible effects on the demand for avocados of product differentiation on the basis of certain shape characteristics. All but the last of such a series of tests would be directed at localizing the method of attack on the problem of increasing the demand for the product. The sequential approach in instances of this nature is an important aspect of the market test phase of merchandising research. Rather close scrutiny should be made at various stages of the research process to determine if the next step is firmly supported by preceding evidence.

The objective of the market test is to provide evidence that can be employed in evaluating merchandising alternatives in terms of their effects upon sales of the product in question. Clearly, the test should be designed so that sales differences can be adequately measured and analyzed. Much thought should be given to the use of procedures that will generate data of the quality needed for analysis and interpretation. A careful examination of the problem of testing merchandising alternatives will frequently reveal the inadequacy of orthodox experimental designs in

[1] Studies have been conducted with a larger number, but the experience of the writer suggests that the problem of design, analysis, and especially administration, more than offset any economies of scale involved.

this capacity. Particular consideration should be given (a) to the possible need for auxiliary controls over sources of variability not handled by the experimental design, (b) to the possible effect of one treatment upon subsequent treatments in rotational types of experiments, and (c) to the necessity for dissipating innovation effects in order that the true long-run sales effect of a merchandising practice will be estimated.

The development of the market test should also reckon with the requirements for data not generated by the test itself. In the analysis and evaluation of the results, the researcher will frequently find he needs data on sales and traffic volumes for the stores employed in his market tests. He may also be confronted further with the need for data on the prices and sales rates of products closely related to the ones he has under consideration. All such requirements should be taken into account in the formulation of the market test. The correction of oversights after the field work has been completed is invariably difficult, and often a matter of impossibility.

A commonly overlooked aspect of merchandising research is the value of observational studies as a source of auxiliary information that will aid in the interpretation of results. Too often, researchers proceed on the assumption that their concern lies exclusively in the area of how consumers react to a specific situation and disregard the underlying reasons behind their actions. The problems encountered in the full interpretation and application of merchandising research results that this position is frequently untenable. Much valuable information can be obtained by the development of techniques for observing the behavior of customers when confronted with a test situation, or in the course of their entire shopping trip while a market test is being conducted.

Evaluation of results in terms of applicability to the retailing situation

The conclusions reached in the market test have little value unless they lend themselves to practical application by the retailer. The retail store operator is confronted with the complicated problem of optimum use of his total resources. There are three categories of these resources: space, capital, and management.[2] Consideration involving all of these enter into his decision to accept or reject a proposed merchandising innovation.

It is fundamental to the problem of application that a merchandising method must have demonstrable capabilities for increasing the returns of

[2] Space is, of course, a part of the capital resources committed to the retailing operation. In a given retailing situation, however, it may well be regarded as a separate entity. Unlike other capital, it must be added in units of such magnitude that a change in the character of the retailing unit is precipitated.

the retailer. The researcher may proceed through the first two phases of the merchandising research process with his attention focused primarily upon the objective of increasing demand. However, at this juncture, matters of operational efficiency inescapably enter into his activities.

In considering the revenue potentialities of a newly advanced merchandising idea, the retailer also considers the costs involved. He views these from an absolute, opportunity and managerial standpoint. Upon learning that fresh orange sales can be increased through packaging in cellophane bags, for example, the retailer becomes immediately concerned with the added costs of packaging oranges in relation to the returns he may expect. He considers space requirements of this merchandising method in relation to the total space available for the storage, preparation and display of fruits and vegetables. He considers the effect of the packaging process upon his labor distribution, and in terms of the capabilities of his employees to handle packaged oranges without excessive breakage or loss. He might well consider, also, the effect of increased orange sales upon the expenditure of his clientele for frozen orange concentrate, canned orange juice, and other fresh fruits. On the basis of these and possibly additional considerations, he must reach the conclusion that he will reap a financial reward if the method is to be adopted. In actual practice, the decisions of the retailer seldom turn out to be the simple matter of a choice among alternatives that can be based upon the superficial advantages of different merchandising techniques as indicated by sheer sales results.

The evaluation of the applicability of merchandising practices may well call forth the full array of research methodology. In some instances case studies may be used to obtain supporting evidence relating to the sales effects and cost considerations in different retailing situations. In others, the evaluation may entail the budgetary approach, with the necessary data being drawn from the accumulation of marketing research pertaining to costs, margins, space allocation, and other aspects of retailing.

It is not difficult to visualize a need for more elaborate experimental studies to cope with the problem of evaluation than those customarily associated with the market test. Ideally, such studies should provide for the measurement of the sales effects of a merchandising practice under varying conditions of store management, type, size, and clientele, while at the same time accumulating relevant cost information.

The experimental approach might be employed with equal advantage to determine optimum combinations of merchandising practices for groups of related products under circumstances involving characteristically different retailing operations. From such efforts may emerge a set of principles that would be especially valuable in assisting the individual retailer

to apply the results of merchandising studies when time or resources are insufficient to permit an examination of the problem of application.

The nature of the merchandising practice may be such as to preclude the possibility of a truly objective approach in evaluation. In such instances the researcher may rightfully approach the problem subjectively. He may make an evaluation by giving the matter much hard thought. The retailer would be assisted materially by carefully considered reasoning on the part of the researcher concerning the conditions under which a new merchandising practice may be profitably applied and the extent of its revenue producing possibilities.

The development of evidence in support of applicability may well turn out to be the most troublesome segment of the entire merchandising research process. In fact, it would certainly seem to be the one calling for the greatest amount of research ingenuity and imagination. However, the difficulties involved do not obviate the responsibility of the researcher to put forth an effort equivalent to the importance of the problem. Merchandising research results have little merit unless the retailer is furnished the basis for determining their value in his particular operation.

Conclusion

Merchandising plays an important role in the marketing of agricultural products. We live in an age when promotion is a major feature of the marketing process, an age in which the economic survival of individuals, firms, and even industries often depends upon their ability to capture the attention of the consumer and vie successfully for a share of his expenditures. Agriculture in general may well intensify its activities in this direction through the research agencies it supports. For those segments of the agricultural economy adversely affected by trends in consumption or faced with the necessity of marketing annually increasing per capita supplies, a redoubling of effort in the field of market promotion would seem especially important.

Although other aspects of market promotion deserve, and in fact, demand attention, great possibilities for improving the economic position of agricultural groups would seem to lie in providing "ammunition" for the man on the firing line—the retail store operator. The contention of this paper is that effective merchandising research at the retail level must reckon fully with the problem of promotion from its fundamental beginnings with the consumer to the successful and profitable application of specific merchandising practices in the retail store. Only through an organized and carefully considered approach can we develop and execute a plan of research that will provide the retailer with the means of improving his merchandising methods and evidence that it will be to his advantage to use them.

DISCUSSION: ECONOMIC BASES FOR MARKET DEVELOPMENT PROGRAMS

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Although Dr. Horne's paper is concerned almost exclusively with cotton, I think that many of the points raised are applicable to market development programs generally. The ideas he has presented are valid and well expressed. There are minor points on which one could take issue, but in the time allotted, I feel that it would be more important to expand on some of his basic points by relating these to programs for market development in the food field. In addition a few comments will be made to emphasize activities undertaken by producer groups.

I would like to discuss three points made by Dr. Horne. First, he ties research and promotion together which certainly is desirable and useful. Second, I would like to relate food to the question raised concerning the fact that cotton and other textile consumption has not risen since 1948 with the expansion of consumer income. Third, his point concerning the incentive of the individual firm to expand the total market for agricultural commodities needs amplification.

First, in textiles, unlike food, research needs are primarily those that are aimed at providing the consumer with different forms, different kinds, different textures, different feel and different looks and physical properties of goods. On the other hand, in foods there are some means, of course, of changing the form in which the consumer utilizes food. This does not usually change the basic taste of the commodity but rather the ease with which it is delivered to her door or to her grocers' shelves, such as frozen concentrated orange juice or prepared cake mixes over their older counterparts. On the other hand, most of the research needed involves a consideration of means of providing the consumer the kind of package, the kind of service, the form and size of the product that will induce her to consume more of given products. Additional research, of course, is involved in stabilizing quality, improving means of getting food to the consumer, but by and large the research needed is in the marketing stages rather than in the production and processing.

In cotton, physical and social sciences have been combined in research in developing product and market. Market research has indicated needed changes in physical properties. Physical research has provided answers to the markets needs. Undoubtedly a program of market development based on this backing must in the long run be successful. Horne indicates

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the small expenditure for total research on cotton. Imagine how small the total is for other commodities less forceful in industry action.

Second, the proportion of consumers' income spent for food in the prewar years averaged around 23 per cent. With an expansion of income since the war, the proportion of the consumer's income spent last year for food amounted to approximately 26 per cent. Of course, there are additional services involved. There are additional spreads between the producer and the consumer so that the amounts of food in total have not changed too much but the kinds of food and the method of selling has changed radically. No one has proved that we can't change the amount consumed in terms of agricultural resources used. This even in the face of increasing consumer debt which has now reached a point higher than any time in our history—an increase of about 5 billion dollars from this time last year. Since payments on this debt are fixed expenses that have to be met out of the consumer's income in competition with food for the consumer's dollar, our attempt to maintain this proportion of expenditure is one problem in expanding our markets.

Third, even more than in cotton, the dispersion of ownership of production and distribution facilities for food is a basic problem in selling. The number of individual firms involved in producing, transporting and distributing food in this country indicates one of the most competitive parts of our economy. For one brief example, in general our products are sold by producers to distributors and processors who handle a wide variety of products and only handle our commodities in the hope of gaining profit by its sale—which is as it should be. The retailer who is charged with the responsibility of finally delivering our products to the consumer is also selling such variety of products as children's books, magazines, flowers, kitchen utensils, cosmetics, medicines and in some instances standard items of clothing such as ladies' stockings and mens' socks and underwear. Each of these items is stocked and pushed in some relation to the profit he makes from them or in relation to the demand he has for them. He naturally pushes those products bearing the greatest chance for the largest profit. If we expect him to push our goods, we must, in some measure, work toward the end of the creation of the demand for our product.

Horne has well indicated the problems of competing in a market where vertical integration of production and marketing is not the exception. The idea of competing in a market where the producer controls sales through licensing retail outlets, through "fair trade" of the prices for his products, and through tie-ins of advertising and sales promotion display space for his products, is a far cry from the picture we see in most agricultural commodities. How then do we provide programs that can develop markets in competition with these competing areas for the consumer's dollar? Our

concern grows more acute when we see that the marketers of our production are concerned not only with selling our products but with selling many others, and therefore they may not desire to add the sales promotion or research effort necessary to influence the demand for our production. In general the separate business firms distributing our production do not assume the same responsibility for creating or expanding markets, at profit to the production department, as does the sales department of a firm where production and marketing are under the same management and control. This basic fact must be recognized and we must learn to operate within its framework.

The producer then must assume at least some of the responsibility for research and promotion efforts if he is to compete in the selling of his commodity. His products lose identity upon their first sale. His control is lost after first sale and his distributors care little about selling his particular product over many others. The only way then for him to act is through research to discover ways of improving his demand position, promoting this idea not only to the consumer, but to the seller who represents him in the market. In the early days of the American Dairy Association, for example, it was thought that the distributors and manufacturers who sold the dairy farmers' products would do the marketing research necessary to sell his product. Today we find that that is not the case, that it is necessary for the dairy farmer to learn how to sell more milk, ice cream and butter if we are going to be able to expand consumption. But we must work with the distributor if we are to be successful.

How well have we been able as economists to conduct research useful in expanding markets? How well can we explain why the consumer desires a new 1956 car rather than additional wardrobe? What have been the forces that have been successful in creating the demand for durable goods? How can we relate these activities to farm products? Good and distinctive eating certainly goes along with good and distinctive cars.

We need to learn if or why it is possible to expand markets easier in an industry when ownership is concentrated rather than widely dispersed. These are some of the more basic questions research needs to aid in answering for agricultural producers. When we can approach the problems in a constructive manner and provide answers, then we will better be able to describe the "economic bases for market development programs." I hope we don't have to wait too long.

DISCUSSION: NEW TECHNIQUES IN CONSUMER PREFERENCE RESEARCH

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The paper by Kiehl and Rhodes can be said to be concerned with two basic problems, (1) methodology in consumer preference research and (2) the implications of consumer research as it applies to "(the) discovery of quality factors—that have meaning to consumers . . . formulation and development of quality standards . . . consideration of the interdependence of preferences, quality standards, production and distribution techniques and costs." The present comments are directed mainly to the latter area—the implications of consumer preference research rather than to considerations of methodology. As Kiehl and Rhodes indicate, there is a growing interdisciplinary concern with the methodology of consumer preference research and considerable gain has been made. We can expect this to continue, most likely in an accelerated fashion. The time has come, though, when we should pause and take a hard look at what is going on. A hard look in the sense of asking, "What is this really all about?" and "How does this consumer preference research fit into established concepts and practices in the field of marketing?"

The present writer's background is in experimental psychology and when he first encountered consumer preference research he felt challenged at the level of methodology. As this work continued the methodological challenge remained, and even increased. A new level of concern arose, however. What is the functional role of such research in the area of the practical affairs of marketing? More particularly, how should consumer preference research enter into the problem of grading standards? Kiehl and Rhodes have much to say on these matters. The purpose here is not to criticize their comments but to use them as a spring-board to further questions.

When a psychologist who, quite frankly, is unfamiliar with the literature on grading, attempts to locate definitive statements as to the purposes of grading he ends up highly frustrated. One gets the impression that consumer preferences (more as a concept than factual data) have some place in grading systems. Some authors even imply that grading exists primarily for consumers. Some imply that grading should reflect consumer preferences. For some—the realists, perhaps—a grading system seems to have the purpose of facilitating the pricing of a product as it moves through the distribution channel from producer to retailer. In some instances a single grading system operates throughout the channel. The grading of grain seems to be an example of this. However, a single system

applying throughout the distribution channel does not always exist. Livestock, as I understand it, involves three grading systems in passing through the channel: live animal grading, wholesale-cut grading and retail-cut grading. Do most grading systems have as their primary purpose the facilitation of pricing through the distribution channel? In such systems consumer preferences do not appear to be explicitly accounted for among the various criteria used in establishing the grades. There is an implication, however, that the grades do, in fact, reflect consumer preferences. If we continue to get data comparable to that of Kiehl and Rhodes demonstrating inconsistency between grades and visual and eating preference for steaks, a serious question will be raised as to the validity of that assumption.

Can we dare to advocate grading systems based primarily or heavily upon consumer preferences? Certain difficulties with such a base are immediately obvious: (1) *Methodological problems*—are there available methods for determining consumer preferences of sufficient validity and reliability for application to a problem of such tremendous importance? Kiehl and Rhodes point to some of the limitations of current methods. Surely no one would want to see consumer preferences used as a key factor in a grading system unless the preference data rested upon irreproachable methodology. (2) *Latitudinal variance*—by this we mean variances of the type represented by regional differences in consumer preferences and, perhaps, differences within regions of the urban-rural variety. The extent to which consumer preferences contribute to differential grading or pricing of white and brown eggs seems to illustrate the kind of problem that can arise from latitudinal variance. The existence of a high degree of latitudinal variance would tend to make for chaos in a grading system applied to nation-wide production. Finally, research of sufficient magnitude to detect latitudinal variance is rather expensive. (3) *Longitudinal variance*—this is variance of preferences through time. Suppose we do have a situation where effective methodology and minimal latitudinal variance have led to grades based upon consumer preferences. Can we assume that two or three years from now the consumer preference pattern will have remained constant? At best, this particular problem would require a continuing research program, the cost of which would certainly be prohibitive. (4) *"Tyranny of the consumer"*—one of the criticisms of market research is that it can lead producers to cater to the "least common denominators" in public taste and in so-doing bring about a gradual deterioration of intrinsic quality in form of extrinsic or irrelevant attributes of products. It is not unusual for market research to show that consumers evaluate products on the basis of attributes that have little or nothing to do with intrinsic quality. Even worse, it has been shown that consumers

sometimes interpret attributes of products exactly the opposite from what they really mean. The findings of Kiehl and Rhodes that visual preference for steaks tends toward the leaner cuts rather than toward the fatter or marbeled cuts is a case in point. If, for a given product, consumer preference research should reveal that irrelevant attributes are the main factors in consumers' judgments as to quality, are these attributes to enter strongly into the grading system? Then, too, what about the possibility of incompatible findings in the research? Kiehl and Rhodes show that visual preference for steaks is toward the leaner cuts; eating preference is toward the fatter cuts. How will the grading system accommodate such incompatibilities?

One could say that consumer preferences should not be a sole or primary factor in grading systems but should be integrated into a system that reflects two sets of factors—preference factors and those factors in production and processing that make for differential quality and costs in goods. If we attempt this the first problem to come to mind becomes one of weighting the various specific factors in order to achieve a final grading system. Who is to handle this problem? I suppose, the experts for each product category. What will be the criteria for eligibility as an expert? What rationale shall the experts use in allocating maximum scores to the specific factors? The "United States Standards for Grades of Canned Orange Juice" gives the maximum number of points that may be given color (40 points), flavor (40 points) and absence of defects (20 points). How was it determined that color and flavor are of equal weight? Are they equal in weight for the experts? Are they equal in weight for consumers? Suppose a consumer preference research project showed that the consumer weghting was 60 for flavor and 20 for color instead of 40:40? Would, or should, the experts allow this finding to change the scoring system?

This writer does not have the slightest notion as to what the answer to these specific questions should be or to the more general question of the role of consumer preferences as a factor in grading standards. But, since there is this increased activity in the consumer preference research field and almost invariably the work is said to be related, in some undefined manner, to grading standards, someone had better start asking the questions. Consumer preference research approached as a sort of academic problem or exercise is a most interesting and challenging field. It is a field in which the psychologist can make some contribution. When we shift to the question of the practical implications of consumer preference research in marketing food products it seems that the psychologist's contribution shrinks to question raising. The search for the answer will fare better in the hands of people like Kiehl and Rhodes who have demon-

strated their sophistication in the methodology of consumer preference research and are highly knowledgeable with respect to grading systems. Perhaps one year the American Farm Economics Association or the American Marketing Association will devote one of its sessions to the problem of "consumer preferences as a factor in grading systems."

DISCUSSION: RESEARCH ON IMPROVED MERCHANDISING OF AGRICULTURAL PRODUCTS

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A challenging question confronts us during this afternoon session: "Can We Expand Markets for Farm Products?" The title of Professor Godwin's paper calls for a discussion of "Research on Improved Merchandising of Agricultural Products."

He examines for us some research activities relating to sales promotion by food retailers. This task is handled by describing the three elements of "a sequential method of attack on problems confronting retailers or agricultural producers." Godwin does an effective job in discussing (a) the identification of the problem, (b) the testing of alternatives, and (c) the evaluation of test results in terms of applicability. Yet I am sorry to see him devote his efforts almost exclusively to this phase of research.

I do not think too many of us lack an understanding of the essentiality of these three aspects to any systematic and well-conceived research project. Of course, I must hasten to add that at times our published works seem to belie this assertion.

The contribution of consumer surveys in assisting to identify merchandising problems is examined at length. A strong case is advanced. Maybe the case is overstressed. Some limitations of this approach could have been acknowledged. I am not yet ready to deplore completely the "declining vogue of the consumer survey." Maybe it and its results have been used too freely.

Ad hoc empiricism based upon survey results buttressed by supplemental information seems to provide the basis for examining alternative merchandising techniques. There is no mention of theory. Wouldn't a theory of merchandising lend any assistance? Without it the research appears to emerge primarily from the investigator's own experience with and evaluation of individual cases. Such results may be of limited usefulness.

Godwin points out, and rightly so, that both costs and sales receipts must be considered when a merchandising innovation is proposed for

adoption. This fact is well illustrated by appropriate examples. Of course, sales promotion must be wedded to operational efficiency at this juncture. But I was surprised to have the necessity of considering the retailer's net revenue function stressed so much. An elaboration of the paragraphs immediately prior to his "Conclusion" would have been more appropriate.[1]

This concludes my remarks on points raised by the author. I wish to comment on others that lie beyond the discussion area staked out for his paper.

I think the role of retailers is overplayed. The retailer is "the man on the firing line" in the sense that he is the final instrument for making consumer sales. But he is not the principal person involved in sales promotion of individual food products. This merchandising program begins at an earlier stage in the distributive channel. Many producers participate, as do numerous wholesalers.

Let me recall the avocado and the orange—merely to mention the two foods used as illustrations. No retailer was concerned a generation ago because so few consumers bought so few avocados. Market expansion for fresh citrus, for canned citrus, and for frozen citrus was stimulated by growers, shippers, processors, and wholesalers. Yes, retailers participated, and gladly, in the increased market. But they were not the pioneers in creating this demand. A similar situation exists for many fruits, vegetables, meats, dairy products, grain products and other food categories. Often the impetus to gain consumer acceptance comes largely from groups other than retailers.

Even with innovations directed at improving operational efficiency many changes are not introduced by retailers. For example, no retailer—or group of retailers—forced the carton container upon the citrus industry. Yet its introduction is increasing operational efficiency at the retail level.

These statements should not be misinterpreted. Retailers are as aware as any group of the revenue potentialities of various demand-stimulating techniques. But their interest is different. Producers, processors, and large-scale handlers are concerned primarily with merchandising individual products or a limited group. In fact, their chief interest may be in pushing particular brands. Retailers, on the other hand, selling thousands of items, face a different problem. They are concerned mainly with increasing their net revenue from the entire product mix handled.

Competition for display space, effect of shelf life, necessity for rapid turnover, use of loss leaders, introduction of nonfood items, the role of

[1] In passing I would like to point out that the retailer doesn't face "the complicated problem of optimum use of his total resources." Actually, in practice, he is confronted merely with the necessity of improving their allocation so as to increase efficiency. The operator rarely, if ever, has available a set of alternatives including the optimum combination.

advertising, and the battle of brands are some of the retailers' problems worthy of attention by the researcher. They are a part of sales promotion. Merchandising research must consider them.

It might also be well to recognize explicitly differences in store size. In this country we have some large national and local chains including hundreds of retail outlets. At the other extreme, there are many "pappy and mammy" and other small independent retail stores. The various categories face different problems. Large chains, with considerable financial resources, can undertake market analysis and other research as a basis for developing merchandising programs. The small stores cannot do so. Their sales promotion must be guided largely by imitation, intuition, and competition.

Godwin's paper outlines well a suitable philosophical orientation for the investigator. Its guideposts apply to research dealing with sales promotion for an individual commodity or product group undertaken by a single food retailer. They are equally appropriate for other problems in the area of merchandising—or, for that matter, in any research project.

As agricultural economists we still have unanswered questions. What are the important merchandising problems? Are there any suitable theories of merchandising to guide our research? What alternative hypotheses warrant testing? Are research results useless unless they lend themselves to application by the retailer? Do demand-stimulating activities by retailers expand markets for farm products?

THE POOR IN AGRICULTURE

Chairman: H. R. Stucky, New Mexico A. and M. College

SOME MYTHS OF SOUTHERN ECONOMIC GROWTH: A STUDY OF COMPARATIVE GROWTH RATES IN THE MANUFACTURING ECONOMY OF THE 11 SOUTHEASTERN STATES

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THERE is, so it seems, general agreement among agricultural economists that the solution of a major part of the low-income problem in agriculture is dependent upon growth in the nonagricultural industries and the integration of agriculture's labor and capital markets into that growth process. The integration of factor markets between agriculture and other sectors is essential, not only to the solution of the low-income problem in agriculture, but is also a necessity for achieving maximum economic growth.

There is an array of problems forming the bottleneck between agriculture, especially in the low-income areas, and the main stem of economic growth. Some of these problems have merely been identified. Little is known about their characteristics or how they might be removed. Other problems, perhaps, remain to be identified.[1]

The main point of this paper finds its relevance in a group of problems associated with the geographical location of economic growth. The problems may be formalized in the following set of propositions. Uneven economic growth rates among areas within the United States are thought to be associated with the labor-surplus and capital-deficit problems that are manifest in the low-income areas. Agricultural areas isolated by distance and/or culture from points of growth in the economy fall behind other agricultural areas due to failure of the population of these areas to adjust its numbers to the resource base, and the failure of the capital market to function as efficiently in serving the needs of agriculture in isolated areas as in areas located in close proximity to points of rapid growth. Two means of population adjustment to the resource base are recognized; (1) by reducing birth rates to a level that will conform with economic opportunity within the area, and/or (2) by the mechanism of

* I have benefited from the suggestions made by my colleagues, Professors M. B. Badenhop, H. J. Bonser and R. B. Hughes.

[1] See T. W. Schultz, *Economic Organization of Agriculture*, McGraw-Hill, 1953, especially Part III. And S. L. McDonald, "The Integration Process and Agricultural Problems," *Journal of Farm Economics*, August 1953, pp. 371-380.

migration. Given the slow response in birth rate changes, a major part of the burden of population adjustment within these areas would fall upon the migration mechanism within the short run. Given also the usual pattern of off-farm migration that is common to American agriculture (the drawing out of youth), the problem of capital deficits for the low-income areas generally and for the agriculture of these areas particularly may be expected to persist. This problem will remain unless some form of transfer payments are put into effect to offset the continuous capital drain upon these areas incident to the rearing and education of labor for export.[2]

The above brief statement of a set of hypotheses is sufficient here without further elaboration to recall to mind that which has been commonplace throughout the literature in recent years.

Within this framework of ideas many people have viewed the problem of low farm income in the Southeast with the hope that it will be solved by what is thought to be an exceptionally rapid rate of growth in the manufacturing economy in that Region. I shall attempt to show: (1) that the rate of growth in the manufacturing economy of the Southeast is not in fact exceptional, and in some respects is falling behind; and (2) that the current rate of economic growth in the Region falls far short of that necessary to absorb its current and prospective expanding labor force.

Going from the never-never land created by novelists about the antebellum South to *Tobacco Road*, it appears that legend and fiction about "Uncle Sam's Other Province" below the Mason and Dixon line, as Allan Tate phrased it, has a way of becoming the accepted description of the Region. In the popular mind there always exists the solid conviction that the South is another land, sharply distinguished from the other part. About what its peculiarities may be, and why—there is, of course, much conflict of opinion. That it is different though, there is genuine agreement. There arises occasionally, to be sure, some who say that the differences are more apparent than real, that its distinguishable characteristics are found merely in such matters as politics, racial makeup and climate. No one has ever taken these commentators seriously. And rightly so.

The South has long been an enigma even to its own people, because the picture of the region has been painted more often with fiction than facts. Too often when facts were employed they were overdrawn by scenarist rather than interpreted by analyst.

The present author harbors no illusions that this mission of myth breaking will set the truth free for all to view the South in its true light.

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[2] See E. J. Long and P. P. Dorner, "Excess Farm Population and the Loss of Agricultural Capital," *Journal of Land Economics*, November 1954, pp. 363-368. And James D. Tarver, "Cost of Rearing and Educating Farm Children," *Journal of Farm Economics*, February 1956, pp. 144-153.

To strike out at popular misbeliefs, whether they be completely false or part truth, is neither an easy nor a pleasant task. One must be armed with overpowering facts that are beyond doubt, and such is rarely available. Furthermore, to merely win a point by the revelation of facts is an empty achievement. Unless the iconoclast can bring to light truth that is relevant and acceptable to those interested in the problem, his work is in vain.

The most logical point of departure for a discussion of myths of economic growth of the South carries one back to the Civil War. In the popular mind of the South this event is associated with one of the most

TABLE 1. PER CAPITA WEALTH OF THE SOUTHERN STATES AND THE UNITED STATES, 1850–1912

Year	Per capita wealth		
	Southern States		United States
		Adjusted*	
1850	$ 502	$317	$ 361
1860	923	569	605
1870	309		780
1880	400		870
1890	512		1,036
1900	521		1,165
1904	587		1,318
1912	1,187		1,982

* Adjusted by deducting the value of slaves as property and adding the slave population in with the total.
Source: United States Census, 1850 to 1912.

persistent and firmly held myths regarding the economic growth of the Region. This remains true in spite of the countless times the image has supposedly been broken by informed writers.

The destruction of the South by the Civil War, and the political, social and economic chaos that came in its wake have often been used as an easy explanation for the economic backwardness of the South. If one examines the census data on decline in per capita wealth in the South as a result of the war, there is evidence that appears to support this idea (Table 1). In the two decades prior to the war, per capita wealth in the South was approximately 59 percent higher than the national average. The Census of 1870 showed that per capita wealth of the Region had been reduced to one-third the prewar level, and was less than 40 percent of the United States average. It was not until after the turn of the century, according to this reasoning, that the per capita wealth of the South regained its 1960 level, and after almost a century it has not regained its relative position.

Two things should be said in connection with these data. Before the war, slaves were enumerated by the census as wealth, but after the war they were classified as persons. How much of the apparent economic loss was accounted for by this change of status for the Negro population is not clear. A crude estimate may be made by deducting the census reported value of slaves from total wealth and adding slaves to the free population for the years 1850 and 1860 (see Table 1). When this is done, one comes out with a per capita wealth figure for the South considerably below the non-South for the years 1850 and 1860. This suggests that a large part of the decline in per capita wealth between 1860 and 1870 was due to the freeing of the slaves. The second point is obvious: Time itself has worn this explanation out. That the war with its great material destruction and disorganization was a serious blow to the economy of the Region, which could not be overcome immediately is not debatable. Clearly though, it would not require almost a century to recover from even so great a catastrophe.[3]

A second myth about the economic growth of the Southeast, which appears to be a special sort of appurtenance attached to the minds of some New England politicians, has to do with the relocation of industry from other areas into the Southeast. Judging from the statements appearing in the popular press and the inferences left in some professional writing, one might conclude that a major part of the industrial growth of the Region has come through relocation.

References of relocation are made most often to the textile industry. This industry began its shift from New England to the Southeast before the turn of the last century. A prime incentive was to take advantage of lower wage rates in the Southeast. This regional transfer was accomplished in the long run by the investment of replacement and new capital in the Southeast instead of other areas, rather than by picking up operating plants for relocation in the new area.

On the basis of a study made by the National Resources Planning Board in 1942, the conclusion was drawn that relocation was relatively uncommon in the textile industry.[4] Further evidence is provided by a study of plant location in the Tennessee Valley area made by Robock covering the period from 1940 to 1951 which revealed that only eight plants employing less than 600 workers had been relocated in that area out of a total increase of several thousand new manufacturing plants in the area during the period. The author also made the significant observa-

[3] For an excellent discussion of the effects of the war on the Southern economy, see W. H. Baughn, "Capital Formation and Entrepreneurship in the South," *The Southern Economic Jourial*, Vol. XVI, October 1949.

[4] National Resources Planning Board, *Industrial Location and National Resources*, 1942.

tion that none of the eight relocated plants had been transferred from New England.[5]

The New Myth

It is difficult to state precisely the big image that evidently possesses the minds of many people about recent economic growth of the Southeast. One gains the impression from the adjectives and superlatives used to describe the industrial growth of the Region that the Southeast is fast becoming an industrial giant that will surely dwarf all other areas in the Nation in a few short years. The epitome of this myth was spread across the cover page of a recent issue of a popular business magazine in the words: "Industry Moves—A Massive and Continuing Flow to the South and West." Still a more euphonious one appeared as a headline to a story in a recent issue of a widely circulated business daily newspaper in the phrase: "An Industrial Colossus Rises Along 'Tobacco Road'." These headlines merely conform to the old adage of newsmen, which hold that to be news it must be sensational. Certainly we have no quarrel with newsmen on this score. But, often to be sensational requires omitting some facts, and overplaying others.

Fortunately the Bureau of the Census plays no favorites in reporting the facts it collects. On the authority of that well known agency we find that between the years 1939 and 1953 the Southeast gained one-tenth of one percent in its percentage of total production workers employed in manufacturing in the United States. To be specific the Southeast had 15.0 percent of all production workers employed in manufacturing in the United States in 1939. In 1953 the Region had 15.1 percent of the total (see Table 2). One could hardly find justification for the use of superlatives

TABLE 2. GROWTH IN MANUFACTURING EMPLOYMENT IN SOUTHEAST AND NON-SOUTHEAST, 1939–53

Area	Number of production workers (000)			Percent increase		Percent of U.S. total		
	1939	*1947*	*1953*	*1939–47*	*1947–53*	*1939*	*1947*	*1953*
Southeast	1173	1736	2042	47.9	17.6	15.0	14.5	15.1
Non-Southeast	6635	10180	11459	53.4	12.5	85.0	85.5	84.9

Source: U.S. Department of Commerce, Bureau of the Census, *Census of Manufacturing: 1947* and *Annual Survey of Manufacturing: 1953*.

to discuss this growth trend when contrasted with the national growth in manufacturing.

During the years from 1939 to 1947 manufacturing employment in the

[5] S. H. Robock, "Industrialization and Economic Progress in the Southeast," *Southern Economic Journal*, April 1954, pp. 307-327.

Southeast increased at a slower rate than it did in the rest of the country. The reverse was true in the period 1947-53, when the Southeast showed about a five percent greater increase than the non-Southeast. In total it must be concluded that growth in manufacturing in the Southeastern region has been within the framework of an expanding national manufacturing economy. Only in that sense is its rate of growth significant. Even though it is moving at a fast rate, it is only keeping abreast.

Improvements in Efficiency and Changes in Structure

Increasing the number of employed workers is only one dimension of economic growth. An equally significant dimension is revealed by changes in resource productivity. This, of course, is the most difficult aspect of growth to measure. No reliable data is available on individual factor productivity. However, we do have a crude measure of the productivity of all resources employed in manufacturing in the value added data published by the Bureau of Census.

The value added per worker is only a rough measure of the combined productivity of all agents of production employed in an industry or region, and as such does not provide any basis for evaluating the efficiency of any single factor of production. There are several reasons that individually or together may account for variations in value added per worker among industries or regions. Variations in the efficiency and skill of labor or management, and in the size of plants, may account for differences in output. The most commonly recognized reason, however, concerns differences in the amount and quality of capital equipment used in production. In an industry or a region where a relatively high proportion of the production process utilizes hand methods, the production per worker, other things being equal, will be less than in another industry or region where the production processes are mechanized.

A further limitation of these data should be noted, in that no adjustments are made for relative price changes) over time or among regions) of raw materials or finished products. Therefore, it is wise to make comparisons of changes in output only when using aggregates rather than individual industries. With the above limitations in mind, we will proceed with the analysis.

In total, the average value added per worker employed in manufacturing in the Southeast increased 204 percent compared with 188 percent in the non-Southeast during the period 1939-53 (see Table 3). This relative gain in the Southeast is indeed spectacular, but it loses some of its significance when we compare the actual differential that still remains between the efficiency of manufacturing resources in the two areas. In 1939, the average Southeastern manufacturing worker, and the other agents of

TABLE 3. CHANGES IN VALUE ADDED PER PRODUCTION WORKER IN MANUFACTURING INDUSTRIES, SOUTHEAST AND NON-SOUTHEAST, 1939–53

TABLE 3. CHANGES IN VALUE ADDED PER PRODUCTION WORKER IN MANUFACTURING INDUSTRIES, SOUTHEAST AND NON-SOUTHEAST, 1939–53

Industries	Value added per worker						Percent increase				S.E. as % of Non-S.E.	
	1939		1947		1953		1939–53		1947–53			
	S.E.	Non-S.E.	S.E.	Non-S.E.	S.E.	Non-S.E.	S.E.	Non-S.E.	S.E.	Non-S.E.	1939	1953
All mfg. industries	2,152	3,285	5,008	6,457	6,552	9,449	204	188	30.8	46.3	65.5	69.3
Petroleum & coal	4,794	6,594	14,099	11,683	22,250	15,295	364	132	57.8	30.9	72.7	145.5
Chemicals	4,193	7,338	8,297	11,814	14,239	18,359	240	150	71.6	55.4	57.1	77.6
Printing & publishing	4,818	5,487	8,125	9,877	10,592	12,663	120	131	30.4	28.2	87.8	83.6
Food	3,686	4,430	7,524	8,314	10,526	11,419	186	248	39.9	37.3	83.2	92.2
Paper	3,304	3,284	8,150	7,249	11,183	9,847	238	200	37.2	35.8	100.6	113.6
Machinery exc. electrical	2,975	3,817	4,905	6,316	8,409	10,304	183	170	71.4	63.1	77.9	81.6
Tobacco	5,973	2,280	7,485	4,279	7,511	4,324	26	90	.3	1.0	262.0	174.0
Avg. high output group*	4,190	4,641	7,837	8,230	11,166	12,083	166	160	42.5	46.8	90.3	92.4
Electrical machinery	2,758	3,809	4,860	6,104	8,103	9,273	194	143	66.7	51.9	72.4	87.4
Rubber	—	3,364	—	6,073	—	9,236		174		52.0	—	—
Fabricated metals	2,541	3,138	5,086	6,034	6,575	9,044	159	187	29.3	49.8	81.0	72.7
Transportation equip.	2,832	3,268	4,608	6,003	7,416	9,607	162	194	60.9	60.0	86.7	77.2
Instruments & related products	—	3,929	—	5,938	6,775	10,034		155		69.0	—	67.5
Primary metals	3,318	3,219	5,101	5,741	8,945	10,045	170	212	75.4	74.9	103.1	89.0
Stone clay & glass	2,388	3,301	4,630	5,815	7,489	8,880	214	169	61.7	52.7	72.3	84.3
Avg. med. output group*	2,841	3,425	4,887	5,947	7,664	9,505	170	178	56.8	59.8	82.9	80.6
Misc. manufacturing	1,945	2,625	3,423	5,318	5,571	7,784	186	197	67.8	46.4	74.1	71.6
Furniture & fixtures	1,618	2,389	3,933	6,128	5,348	6,955	231	191	36.0	13.5	67.7	76.9
Textiles	1,327	1,950	4,309	4,970	4,412	5,921	232	204	2.4	19.1	68.1	74.5
Apparel	1,212	1,910	3,063	4,780	3,019	5,341	149	180	−1.4	11.7	63.5	56.5
Leather	1,549	1,571	4,168	4,411	5,070	5,055	227	222	21.6	14.6	98.6	100.3
Lumber	1,246	2,318	2,934	5,214	3,593	6,563	188	183	22.5	25.9	53.8	54.7
Avg. low output group*	1,364	2,016	3,845	4,908	4,073	6,234	198	209	5.9	27.0	67.7	65.3

* Group average weighted by numbers employed in each industry.

Source: U.S. Department of Commerce, *Regional Trends in the United States Economy*, 1951, and *Annual Survey of Manufacturers: 1953*.

production combined with that worker, produced slightly less than two-thirds as much as workers with their combined resources in other areas of the Nation. By 1953 the difference in value added per worker was still slightly more than 30 percent in favor of the non-Southeastern area. The difference in value added per worker in dollar terms amounted to about $1,000 annually in 1939, the difference had widened to approximately $3,000 by 1953.

This vast difference in value added per worker is accounted for primarily by differences in the structure of the manufacturing economy of this Region and the non-Southeastern area. If we array the 20 manufacturing industries in the United States on the basis of value added per worker from highest to lowest; then divide the array into three groups—high, medium and low—the difference in structure becomes apparent (see Table 4). In 1953 the Southeast had about six out of every ten of its

TABLE 4. MANUFACTURING EMPLOYMENT BY OUTPUT GROUPS, SOUTHEAST AND NON-SOUTHEAST, 1939–53

Area	Percent of production workers in: High-value-added industries			Medium-value-added industries			Low-value-added industries		
	1939	*1947*	*1953*	*1939*	*1947*	*1953*	*1939*	*1947*	*1953*
Southeast	22.8	26.1	27.1	9.6	11.8	13.8	67.6	62.1	59.1
Non-Southeast	32.2	33.9	30.7	34.4	40.0	43.4	33.4	26.1	25.9

Source: U. S. Department of Commerce, *Regional Trends in the United States Economy*, 1951 and *Annual Survey of Manufacturing: 1953*.

workers employed in the low-value-added industries, compared with approximately one-fourth in the non-Southeast. The percentage of each area's total employment in the low-output industries declined between 1939 and 1953. However, the relative decline in the Southeast was about one-half as great as in the non-Southeast. To put it another way, 45 percent of the growth in manufacturing employment in the Southeast since 1939 has been in the low-output industries compared with 15 percent in the non-Southeast. Moreover, the average output per worker rose faster for the low-output group in other areas than it did in the Southeast since 1939. Since 1947 the rise in output in the low-value-added industries has been about four and one-half times greater in the non-Southeast, than in the Southeast (see Table 3).

The significance of this point should not be overlooked. This group of industries accounts for a major part of the total increase in employment in the Southeastern region in recent years, and accounts for about 60 percent of total manufacturing employment within the Region today; yet the relative efficiency of the resources employed in these industries in the

Southeast compared with the same industries in other areas dropped about 2 percentage points between 1939 and 1953.

This same relative decline in resource efficiency also occurred in the medium-value-added industries. The output per worker in this group of industries in the Southeast stood at approximately 83 percent of the non-Southeastern worker in 1939. This figure had declined to about 81 percent by 1953. Employment in the medium-value-added industries increased at a slightly higher rate in the Southeast than in the rest of the nation. However, this group accounts for only about 14 percent of the Region's total, compared with better than 40 percent in the non-Southeast.

The percentage of total employment in the high-value-added industries in the Southeast increased from about 23 percent to 27 percent during the period 1939-53, while in the non-Southeast the percent of total employment represented by these industries declined slightly.

The efficiency of Southeastern resources employed in the high-output industries are more nearly on a par with efficiency in the same industries in other areas than either of the other two groups. Also, the high-value-added group in the Southeast improved their efficiency at a slightly higher rate than did these same industries in the rest of the nation—rising from about 90 to 92 percent of the non-Southeastern average during the years 1939-53.

To summarize the changes that have occurred in the structure and efficiency of the manufacturing economy of the Region; (1) there has been a small but solid gain in the over-all efficiency within the Region relative to other areas of the nation, (2) this gain has come by way of structural improvement, rather than by intra-industry gains in resource efficiency, (3) improvements in structure are reflected in the increasing proportion of total employment in the medium- and high-output industries, (4) this dimension of growth adds strength and stability to the Southeastern economy, but this alone cannot offset the wide differential that remains between resource efficiency in the Southeast and non-Southeast in the same industries.

Wage Rates in Manufacturing

As was noted earlier, the value-added data provides no basis for comparing labor efficiency among regions or industries, but it is interesting to note that relative wage rates have changed in almost the same proportion that value added per worker has risen in the Southeast. Between 1939 and 1953 wages of manufacturing workers in the Southeast increased 231 percent compared with 213 percent rise in the rest of the nation (see Table 5). This indeed seems to be a significant gain, but again, when one looks at the differential that remains between the two areas, the gain does not appear to be so great.

TABLE 5. AVERAGE ANNUAL PRODUCTION-WORKER WAGES IN MANUFACTURING, SOUTHEAST AND NON-SOUTHEAST, 1939–53

	1939	1947	1953	Percent increase 1939–53
Southeast	$ 760	$1,908	$2,519	231
Non-Southeast	1,222	2,645	3,825	213
Southeast as percent of non-Southeast	62	72	65	

Source: U.S. Department of Commerce, *Census of Manufacturing: 1947*, and *The Annual Survey of Manufacturing: 1953*.

In 1939 manufacturing workers in the Region were receiving 38 percent less than manufacturing workers in the non-Southeast; by 1953 the difference had been reduced by only 3 percent, or remained 35 percent in favor of the non-Southeast.

Although there is reason for optimism in the progress that has been made in the Region, there remains ample difference in national and regional average output and income to challenge all its statesmen and economists. And even though all the details of the picture are not filled in here, it appears very clear that the low-income problem of the Southeast is not restricted to agriculture. The low ratio of productive capital resources to labor, which has held a large part of agriculture in the Region to a marginal level, has also prevailed in the industrial segment. This is not surprising since the same economic principle governing the mixing of available capital and labor in agriculture applies likewise in all other forms of production.

In the broadest aspects of the problem, if the objective is to bring levels of output and income in the Southeast in balance with that of other areas, the solution is not as simple as transferring labor out of agriculture into industry—any kind of industry. The basis of equal levels of output and income in industry, as well as in agriculture, is equality of productive capital resources per unit of labor. There is little evidence that the Southeast is moving toward equality in this respect very rapidly. In fact, the evidence suggests that the Region's industrial economy, like its agriculture, will remain at the marginal rear guard in the national economy. Other areas are not standing still, instead they are forging ahead.

In addition, there is the well-known fact that the natural rate of increase in population of the Southeast is much higher than that of other areas and is far ahead of the labor demands of the Region.[6] This has long been a treadmill upon which the Region has marched.

[6] The natural rate of increase in the Southeast from 1940 to 1950 was 19.9 percent of the 1940 population. The U. S. increase was 13.7 percent. United States Department of Commerce, Bureau of the Census, *Census of Population, 1950*.

Out-migration has served as a sort of escape valve for the Region's population pressure. The last census showed that from 1940 to 1950 out-migration exceeded migration into the Region by 2,114,000 (7.5 percent of the 1940 population). In spite of this high loss of population to other areas, the decennial increase in the population of the Southeast was only 2 percent less than the national average (12.5 compared with 14.5 percent for the nation).

Here one gets a glimpse of the economic significance of the biological fertility of the Region's population. This prolificness of people may be a national asset, if so, the national economic organization has not functioned in a manner so as to take the greatest advantage of it by placing the people in such a circumstance that their productive potential is developed and fully employed either within or outside the Region. As a result of this failure a "wealth" of human labor has rested as a burden upon the Region.

Out-migration has but slightly reduced the surplus of labor, not removed it. Whether or not this immobility of labor in the Region arises from some peculiar cultural characteristic, a lack of actual opportunities in other areas, or a failure on the part of the labor market mechanism, especially in the field of information to distribute labor properly in the economy is not known. The first hypothesis has received little attention other than speculation.[7] The lack of specific information regarding job opportunities, especially in remote rural areas, is considered by some who have studied the problem as factor impeding migration out of the Southeast.[8]

The extent to which the Region will have to depend upon other areas as an export market for its surplus labor in the future depends upon several factors. Most obvious of these is whether or not differential rates in population growth persist between the Region and other areas. Judging from past trends there is little reason to believe that this difference will be removed in the near future. Secondly, the rate of capital investment in the creation of new and expanding employment in the Region will determine the number who will lack employment. To absorb the youth coming into the labor force who are not needed as replacements alone would require the creation of approximately 500,000 new jobs annually for the next ten years (or 5 million for the decade) at the present rate of population growth. In addition there is the need of new jobs for the underemployed in the Region's agriculture who will seek the opportunity to move into nonfarm

[7] A forthcoming publication by B. H. Luebke, Tennessee Agricultural Experiment Station, entitled *Migration from a Southern Appalachian Community: Farm Population Response to the Labor Market,* deals with localized cultural characteristics as impediments to migration.

[8] See Eldon D. Smith, "Nonfarm Employment Information for Rural People," *Journal of Farm Economics,* August 1956, pp. 813-827.

occupations.[9] In the years 1950-55 nonfarm employment in the Region increased by only 1,082,000 workers.[10] To provide nonfarm employment for only the natural increase in its labor force during the next decade would require that the Region increase its nonfarm employment by approximately twice that amount. This still leaves aside the needed reduction in the agricultural labor force.

Such a rate of development is not impossible, but is it likely to take place? It would appear more reasonable to expect that the Southeast will continue to depend heavily upon other areas to absorb its surplus labor.

[9] Any attempt to fix the number of underemployed and the surplus numbers in the Region's agriculture can be no more than a crude estimate. What is important and has meaning in this connection is how many will want to leave agriculture for other work.

[10] United States Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Annual Supplement issue, June 1956, p. 65.

A COMPARATIVE ANALYSIS OF THE EARNINGS OF SOME WHITE AND NEGRO[1] FARMERS IN THE UNITED STATES[2]

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SOUTHERN Negro farmers constitute one of the lowest income groups in the United States. This paper presents some results of an attempt to estimate the differentials in labor income in 1949 between White and Negro commercial farm operators of comparable labor market capacity. The objective here is to isolate the effect of race from the numerous circumstances affecting the incomes of the groups studied. These resulting labor income estimates are considered, along with other data, for evidence of whether there was in 1949 greater or less discrimination against Negro farmers than against Negroes in other occupations.

Limitations imposed by the nature of the data available have caused some of the estimates to be quite crude. The more questionable assumptions made will be indicated, and discussed at appropriate places in this paper. Despite the crudeness of the estimates some positive results are obtained, and it is possible to draw some tentative conclusions about the economic circumstances of Negro farmers.

Most of this study is restricted to 1949, to the South, and to the census group, "Commercial Farm Operators."[3] It is restricted to 1949, because the 1949 Census obtained much more data on income than is available for other periods. It is restricted to the South,[4] because nearly all Negro farmers are in the South, and by considering only Southerners among the White farmers, the effect of region on incomes is held constant. It is restricted to commercial farm operators because some of the relevant data are tabulated only for that group of farmers, and because it was desired to consider the effects of race on opportunities in entrepreneurial farming. The definition of a "commercial farm" is such that operators of these farms generally receive a major proportion of their income from their farming

[1] Throughout this paper the term "Negro" is used to refer to data that, in some cases, has been compiled for "Nonwhites." Most of the "Nonwhites" considered in this study are Negroes, so that the ignoring of the distinction has little effect on the estimates made. In the South, Negroes represent 98.8 percent of the Nonwhite population.

[2] The research on which this paper is based was done at the University of Chicago, under a grant from the Sears Roebuck Foundation. The details of the estimates will be contained in a dissertation to be submitted to the faculty of the University of Chicago.

[3] For the definition of this group see 1950 U. S. Census of Agriculture, Volume II, General Report, Introduction, p. XXXI.

[4] "South" throughout this paper refers to the census definition.

activities. All the tenure classes of commercial farm operators perform some entreprenurial functions, being residual income recipients and participating in varying degrees in the making of business decisions.

Morton Zeman, in a study of 1939 wage and salary income differentials between Whites and Nonwhites who possessed comparable labor market capacities, found that, among urban workers, the ratios of the income of Nonwhites to those of Whites varied with age, education and region. He found that the highest ratios were among the youngest, least educated persons, and varied from .90 in the North and West to between .80 and .90 in the South; whereas the lowest ratios were among the most mature, best educated persons, and varied from .44 in the non-South to .38 in the South.[5]

Zeman was not able to hold age, education or occupation constant, when comparing the incomes of rural Whites and Nonwhites.[6] Subject to this limitation, he found that the ratio of Nonwhite to White income was not affected by urban or rural residence.[7]

It is to be expected that the relative occupational distribution of Whites and Negroes will be affected by the pattern of discrimination against Negroes. Although there may be various barriers to mobility, one would expect Negroes to tend to go where their opportunities are best, and to become concentrated in those occupations and areas where their earning opportunities most closely approach those of whites. Since 1920, Negroes have constituted a steadily decreasing proportion of the farm operators in the South. In 1920, 28.8 percent of the farm operators in the South were nonwhites, whereas by 1950 the proportion had decreased to 21.1 percent.[8] During this period the ratio of farmers to other occupations among the Southern Negro male labor force decreased from .46 to .24.[9]

Thus, in the South, in the period 1920 to 1950, Negro farm operators decreased as a proportion of all farm operators, and the ratio of farmers to other occupations decreased in the Negro male labor force. The question thus arises; do the changes in occupational patterns indicate that Negroes are at a greater disadvantage, relative to Whites, in farming than in other occupations? The occupational data do not indicate that such

[5] Morton Zeman, "A Quantitative Analysis of White-Nonwhite Income Differentials in the United States." A Dissertation Submitted to the Faculty of the Division of the Social Sciences in Candidacy for the Degree of Doctor of Philosophy, Department of Economics, Chicago, Illinois September 1955, p. 202.

[6] Idem. p. 220.

[7] Idem. p. 219.

[8] 1950 Census of Agriculture, General Report, Vol. Chapter XI, p. 924, Table 5.

[9] These percentages refer to the ratio "Farmers and Farm Managers" to "Other Occupations." The data were obtained from the 1920 and the 1950 Census of Population. Changes in census classifications cause the occupational data to be not strictly comparable for the two periods, but the changes are not such as to greatly affect the ratios cited here.

has been the case. Although in 1920, the Negro ratio of "Farmers and Farm Managers" to "Other Occupations" was only slightly larger than the analogous White ratio, by 1950 the Negro ratio was considerably larger. Thus, the decreasing proportion that Negro farmers are of all Southern farmers can be "explained" entirely by the Negro's exodus from the South. Negroes have participated in the change from "farmer" to other occupations, but those remaining in the South have remained farmers in somewhat greater proportion than have whites.

Mobility of a group may be related to various characteristics of the group, such as age, education, marital status, and cultural background. Income differentials in alternative occupations and areas may affect the mobility of groups in different ways, depending on such characteristics of the group. Thus one would not be justified in deducing from mobility data alone, conclusions about income opportunities in the alternative occupations and areas. However, the data presented here indicate that Negroes remaining in the South do not appear to have found "farmer" status any more disadvantageous relative to other occupations than have Whites, which would be consistent with a finding that the relative Negro to White incomes are at least as high for farmers as for the average of all other occupations, when persons of like productive capacity are compared. A comparison of incomes is the major concern of this paper.

A Comparison of Incomes

The 1950 Census obtained information on the money income of individuals and families in 1949 on the basis of a twenty percent sample. From this Census there is available a considerable amount of information on the relation of income to other variables, such as geographic area, urban-rural residence, color, age and education.

Three federal government bureaus issued in 1953 a cooperative report entitled *Farms and Farm People*. This study is unique in that its purpose "is to bring together data to show characteristics of the farm operator families, their housing and other items, including amounts and sources of family income by farm characteristics, particularly economic class of farm and net cash income of farm families. The data on which this report was based were obtained by matching records for the 1950 Censuses of Agriculture and Population for approximately 11,000 farms and farm operators."[10] Thus *Farms and Farm People* presents "estimates based upon a sample of approximately 11,000 farms and the associated farm-operator households, families, and dwelling units, or one-fifth of one percent of all

[10] Bureau of the Census, Bureau of Human Nutrition and Home Economics, Bureau of Agricultural Economics, *Farms and Farm People*, U. S. Government Printing Office, Washington, 3, D.C., 1953, p. III.

such units in the United States."[11] This study permits a matching and cross-classification of information on income, characteristics of the farm, and personal characteristics of the farm operator and his family on a scale not possible before.

From sample data developed for the study *Farms and Farm People* it has been possible to obtain an unpublished tabulation of the 1949 family incomes of Southern commercial farm operators, for Whites and Negroes, together with some of the personal and family characteristics of each group.

TABLE 1. AVERAGE INCOME OF FAMILIES REPORTING INCOME: SOUTHERN COMMERCIAL FARM OPERATOR FAMILIES, 1949[12]

White	$2,191[13]
Nonwhite	686

The ratio of $686 to $2,191 is .31. This is a much lower income ratio than Zeman found for any group of comparable capacities. The over-all income figures for family incomes of farm operators do not compare Negro and White farm operators with like labor capacities. Therefore I have attempted adjustments for the incomparabilities in order to arrive at estimates of the relevant labor incomes indicating the effect of race on earning opportunities in farming.

An Adjustment for Property Income

To investigate the operation of agricultural markets, with respect to race, it would be desirable to compare returns to resources that may be considered equivalent except for the race of the owner of the resources. As part of this procedure it is necessary to allocate the income of farm operator families to specific resources. The income of a farm operator is, conceptually, the income to his management, capital and labor services (and often, to the labor services of some other member of his family as well). The farmer will usually not attempt any such allocation in his accounting.

The most common method used in allocating income to resources in

[11] Ibid. p. 3.

[12] Nonwhite data are from an unpublished tabulation obtained from the Bureau of the Census 2-17-54. White data are computed from the Nonwhite data and the combined color groups data on p. 95 in *Farms and Farm People*.

Data are based upon a sample. For a description of the sample and a statement of the reliability of the data see page 3 of the special report *Farms and Farm People*, published in 1953 by the U. S. Bureau of the Census, Department of Commerce and the Bureau of Agricultural Economics and Bureau of Human Nutrition and Home Economics of the U. S. Department of Agriculture.

[13] Assumes $20,000 as mean income of the open-end income class with $10,000 or more income.

studies of agriculture is to use an accounting procedure, assuming equilibrium with some market to estimate the returns to some resources, and treating one resource as a residual claimant, in order to exhaust the product.[14]

There is available sufficient information to make possible the computation of rough estimates of the operators' equity in their farms, for Southern White and Negro commercial farm owners and managers. If one is willing to assume some appropriate rate of return to capital, then estimates can be made of the total returns to equity capital for these groups, and the residual returns to other resources. This is the procedure I have followed.

By the use of data on the value of farms, the proportion of the land owned by the operator, the proportion of investment in farms that is in the form of land and buildings, and the amount of debt per farm, estimates were made of the operators' equities in their farms. The details of these estimates are too lengthy to be described here. The estimated average equity in the farm business, for Southern commercial farm operators in 1950, is $10,343 for Whites, and $1,169 for Negroes.

A note of caution is necessary here, particularly since I have not described in detail the method by which these estimates have been made. The crudeness of the procedures I have used is such that only the rough order of magnitude of the average equities in farms is obtained. There is reason to believe that the estimates of equity are somewhat too low, both for Whites and Negroes.

Having arrived at an estimate of the average equity (probably a slight underestimate) invested in their farm operations by Southern White and Negro commercial farm operators, by the choice of a suitable interest rate one can estimate the returns to the equity capital, and by subtracting these from the total family income, obtain estimates of the family income from other sources. This procedure involves the assumptions that it is appropriate to use a single, unique rate of return for capital, and that the rate used is the appropriate one. Although any such simplified procedure can produce only tentative results, this method will be used.

The average rate of interest, for all mortgaged farms in the South in 1950, was 4.7%.[15] If one assumes that there is equilibrium in the capital market, in the sense that Southern farmers are receiving a return of 4.7% on their capital, this is an appropriate rate to estimate the returns to their equity capital. 4.7% × $10,343 = $486.12; 4.7% × $1169 = $54.94.

There are two assumptions that may be open to question, involved

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[14] For a discussion and application of this method, see D. Gale Johnson, "Allocation of Agricultural Income," *Journal of Farm Economics*, Nov., 1948, pp. 724-749.

[15] 1950 U. S. Census of Agriculture, *1950 Farm Mortgage Debt*, Coop. Report Vol. II. part 8, p. 14.

here. One is the choice of a particular rate of interest as the appropriate one to apply to all forms of capital, and the other is the assumption that capital owned by Negro operators can be treated in the same fashion as that owned by White operators. If Negroes face obstacles, not faced by Whites in obtaining borrowed capital, it may well be that capital owned by Negroes is somewhat more productive than is capital owned by Whites. I have not attempted to apply separate rates of interest to different forms of capital, or to Whites' and Negroes' equities, but later I will indicate the effect on the final labor income estimates, of the choice of alternative rates of return to capital.

An Adjustment For Age and Educational Differences

Age and education are important personal characteristics related to an individual's labor market capacity. Zeman's study has indicated that not only is labor income related to age and education, but the ratio of Negro to White income varies among age-education classes in a systematic manner.

From sample data it can be seen that the White and Negro commercial farm operator groups are different in their age and in their education characteristics. It is possible to obtain distributions of Southern White and Negro commercial farmers by age and by education separately, but no joint distributions by age and education are available. However, the census does provide joint distributions, by age and education, of "Farmers and Farm Managers," by making use of the considerably overlapping of the groups of "Commercial Farmers" with "Farmers and Farm Managers" and with "Rural Farm Males," bivariate age-education distributions of "Commercial Farmers" have been estimated, for both Negroes and Whites. As would be expected, the Negro farmers are concentrated in the lower educational classes.

No relation of income to age and education is available for "Commercial Farm Operators," so that it is necessary to improvise further to estimate the effect of differences in age and education on the relative incomes of Negroes and Whites.

The 1950 Census provides income distributions for each of one hundred and eight different age-education categories, by color, sex and region.[16] Thus it is possible to estimate the mean income, for Southern males (and females) for Whites and Negroes separately, for each age-education category.

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[16] U. S. Bureau of the Census, *1950 United States Census of Population. Special Report PE No. 5B, Education*, Washington: Government Printing Office, 1953), Table 12, pp. 120-123.

By assuming that the incomes of "farm" males, and the incomes of "rural nonfarm" males, are constant proportions of the incomes of "urban" males, within age-education classes,[17] estimates were made of the incomes of Southern farm males, for Whites and Negroes separately. The nature of the relationship (i.e. constant proportions) is an assumption, and can yield only approximate results. Given this assumption, the estimates are empirical and consistent with the available information.

By making the further assumption that, within age-education-color categories, commercial farm operators have the same mean incomes as farm males, sufficient data is obtained to permit an adjustment of the mean incomes of the farm operators to take account of the effect of differences in age and educational characteristics of Whites and Negroes. This latter assumption appears to be consistent with the $2,191 average income of Southern White commercial farm operators families mentioned earlier, but yields income estimates for Negroes that are too high to be consistent with the estimated average income of $686 for Southern Negro commercial farm operator families. The effect of this inconsistency will be referred to later.

By redistributing Negroes among age-educational classes in the same proportions as Whites (or, alternatively, by redistributing Whites according to the Negroes' proportions), average incomes can be computed and compared, eliminating the effects of differences in age and educational characteristics. If the Negro incomes are multiplied by the White age-educational proportional distribution of commercial farm operators, the resulting mean income is $936.04. This is the estimated mean income that Negro commercial farm operators would have if they had the same age-education distribution that Whites had and if within each age-education category they had the estimated income of Negro rural farm males. The White commercial farm operator mean income computed by using the White distribution and the White incomes is $1825. (Note that these are incomes of operators and are not family incomes.) The ratio of $936.04 to $1824.80 is .51, which is the value of a Laspeyre index of the within age-education category incomes.

If the returns to equity in capital, estimated earlier (at 4.7%) as $486.12 and $54.94 for Southern Whites and Negroes respectively, is subtracted from the $1824.80 and the $936.04, the resulting White income is $1338.68 and the Negro income is $881.10. These are estimates of labor returns. Subtracting the Negro capital return from $936.04 implies the further as-

[17] i.e. $Fi = a \cdot Vi$ and $Ri = b \cdot Vi$; where i refers to an age-education category, Fi is the mean income of farm residents in i, Ri is the mean income of rural nonfarm residents in i, and Vi is the mean income of urban residents in i.

sumption that the capital return would not be affected by the redistribution of Negroes according to the white-age education proportions. The ratio of $881.10 to $1,338.68 is .66, which is thus an estimate of the ratio of Negro to White labor income, of Southern commercial farm operators, if the Negroes had the same age-education composition as the Whites. However, since there is evidence (indicated above) that the Negro estimated commercial farm operator incomes are overestimates, this ratio estimate is probably an overestimate, given the 4.7% rate of interest. This ratio is affected by the rate of return applied to the capital equity. If this return is set at 6% residual labor returns are $865.90 and $1204.22, and the ratio is .72; if the capital return is set at 8% the residual labor returns are $842.52 and $997.36 and the ratio .86.

Thus it is apparent that adjustments for differences in age, education and capital positions make a very substantial difference in the ratio of Negro to White income for the Southern commercial farm operator groups. The ratio can be increased from .31 for the gross family income figures, to a range of from .66 to .86 or higher, depending on the rate of return assigned to capital.

It is desirable to turn back now to discuss briefly a few problems that were skipped over lightly in the above development. Likely the estimates of equity in property are somewhat too low, both for Negroes and Whites. This is the case because it was not possible to estimate equity in nonfarm property, or to estimate equity in property of tenants and sharecroppers. Since, in the South, these amounts are probably very small on the average, likely their omission does not greatly affect the final estimates of income ratios.

Although there are reasons for thinking that the rate of return for Negroes' is probably higher than it is for Whites' capital, the amount of capital owned by Negroes is so small that the ignoring of a possible difference in rate of return cannot have a large effect on the final labor income ratios. The more important problem is the choice of the over-all rate of return to allocate to capital. The best procedure here seems to be to set limits by alternative reasonable assumptions. The procedure for estimating the incomes of Negro commercial farm operators resulted in estimates that were too high to be consistent with the family incomes of the Negro commercial farm operators. The estimated family incomes may be too low, or the estimated operators' incomes may be too high. If the former is the case, then the original gross ratio of family incomes with which the income analysis was begun (.31) is too low. If the latter is the case, then as already suggested, the series of alternative adjusted ratios are all somewhat too high. Wherever the error lies it will not affect the

direction of the adjustments made, and probably does not greatly distort the final results.

There are still other problems not yet mentioned. The concept of income here involved is such that it would be desirable to have estimates of income in kind to add to the money income of the various groups considered. The 1950 Census did not gather information on income in kind. Various studies that have gathered information on nonmoney income have indicated that in general income in kind constitutes a higher proportion of the income of low-income groups than of high-income groups. Thus the exclusion of income in kind probably results in lowering the ratio of Negro to White income. Using data gathered for the Consumer Purchase Study of 1935-38 I have estimated that the exclusion of nonmoney income would result in a Negro/White average income ratio from 7% to 10% less than the ratio of average total incomes, for various groups of Southern farm operators. I would expect the effect to be somewhat less on the income ratios with which I have been concerned in this paper, but very likely the direction of the effect is the same.

Another problem arises from the year-to-year variability in the income of farmers. Presumably the income most relevant to the allocation of resources (and to levels of living) is an average income over some period of years. The choice of the income of one year for the comparison of the income of groups involves the risk that temporary fluctuations in income may cause a temporary fluctuation in income ratios. 1949 was a rather poor year for cotton farmers in the Southeast, and since Negroes are heavily concentrated in cotton farming this probably resulted in a Negro-White income ratio that might be unusually or temporarily low.

The compounding of assumptions and unanswered problems in my study are such that my adjusted income ratios can be considered to be only roughly of the correct order of magnitude. This does not mean that no firm conclusions can be derived from the above analysis. I list below the various conclusions I draw, with an indication of the degree of tentativeness that seems warranted.

1. The crude over-all figures do not compare Negro and White farm operators of like labor capacity, with like non-human capital.

2. Negro farmers average much less capital than Whites, and Negro farmers are concentrated in the less productive age-education classes.

3. The necessary adjustments required to compare returns to comparable labor are substantial, and result in a very considerable increase in the Negro/White income ratio.

4. The adjustments probably cannot eliminate the Negro/White income differential i.e., there probably remains a substantial difference in the

labor income received by Negroes and Whites of similar age and education.

5. The ratios of labor income for the least educated, youngest persons are probably not far from the ratios of .80 to .90, which Zeman found for urban workers in the South (tentative).

6. The data on occupational patterns discussed in the first part of this paper seem to support No. 5 above, and indicate that Southern Negroes probably do not suffer from much more or less economic discrimination than they do in other occupations in the South (very tentative). None of the above says anything about discrimination in general. The low level of education of Negroes, for example, is some function of discriminatory social policies, and is even related to earlier economic discrimination.

WHAT TO DO ABOUT LOW INCOMES IN AGRICULTURE

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Introduction

CHRONIC low incomes still persist as the typical situation in large parts of American agriculture. This is so now after several years of rapid growth in the general economy and after more than two decades of large-scale federal programs directed to farm price and income problems. Increasing public awareness of, and interest in, the persistence of these low incomes has now culminated in the official recognition of them at the national policy level as an important public action problem.

What action holds good promise of alleviating and correcting these conditions in traditionally low-income farming areas is the problem to which this paper is directed. Instead of proposing a prescription, however, my intent is to outline and to analyze, necessarily in broad general terms, the major low-income policy alternatives now open to us, hoping that this analysis and the thought and study it may stimulate will be helpful in the development of low-income farm policies at federal, state, and local levels.

As this statement of my task implies, the major end in view for this analysis is to point to ways of increasing incomes of the nation's low-income farm people. But what is done to alleviate low incomes, including existing activities, will likely have important consequences for other ends or values, both individual and social. Hence, regardless of how effective particular ways of alleviating low incomes may seem, their desirability, viewed from the standpoint of either individual low-income families or of society generally, cannot be intelligently ascertained until we know how these measures are likely to complement or to obstruct the realization of ends or values other than that of merely increasing incomes.

The more important of these other ends or objectives are well known and but a few of them need to be mentioned here—this without passing upon how well based they are. In terms of the values of both the low-income farmers and other American people to increase incomes by increasing productivity of low-income people, where this is practicable, is preferable to income transfers alone. Measures that increase productivity

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of low-income farm people at the expense of decreasing that of other population groups, even along the line predicated in essentially static economic models, are less preferable than measures involving improvements in resources and markets, or that represent economic growth. Low-income farm policy proposals are also likely to be carefully scrutinized for their bearing upon such policy objectives as income stability in agriculture generally, conservation of resources, maintenance of family farms, and preservation of individual freedom. Ways of solving the problem that necessitate a break in cultural ties of low-income people or that will disrupt existing mores, customs, and institutions, say, for example, those embodied in racial relations, may fail to receive serious consideration, or may break down in the policy making process, or if initiated may fail to elicit as good responses as other programs that do not necessitate these kinds of changes.

For analyzing policy alternatives for improving incomes, we do not need to rank and to assess the relative importance of this and other ends (or values). We do need to explore and to bring into the open—far beyond what I shall be able to do in this paper—the probable bearing of policy alternatives upon the values or ends judged important by those whose decisions and actions will determine the future of the low-income problem. Doing this may reveal whether or not the hopes, as well as the fears, entertained respecting particular kinds of solutions are imagined, exaggerated, or soundly based. It should also lead to sounder policies, even if taking cognizance of other ends or values than that of increasing income leads to policies that appear weaker than those that might seem desirable based upon a simpler but less realistic formulation of the low-income problem.

Possible Ways of Increasing Incomes

We can conceive in broadest terms of two possible ways of increasing incomes of low-income farm people, (1) by income transfers and (2) by measures that increase productivity. These two ways are not always mutually exclusive. Many measures to increase productivity may, in the short run, appear to be mainly transfers of income. Conversely, income transfers, even when not tied to changes in employment and production, may have the long-run effect of increasing production.

Income transfers can be made in the form of direct money grants or by the provision of particular goods and services. Old-age pensions represent a common example of income transfer reaching some low-production farm people. Federal and state aid for schools, hospitals, and roads and the food stamp and school lunch program are well known examples of income transfers through the provision of specified goods and services.

Farm price supports and commodity loans administered under agricultural stabilization programs may also be a form of money income transfers largely from nonfarm people to commercial farmers.

As we turn to the increasing of incomes by increasing production, low-income farm people conceptually can raise their incomes either (a) by improvements within agriculture or (b) by changing their kind of employment. The improvements may range from very simple farm practice changes to changes in sizes and types of farms that may require major changes in factor and product markets and servicing agencies, in credit and tenure practices, in the direction of agricultural education and research activities, and in the general structure of the communities in which the low-income people live.

Raising incomes by changes in kinds of employment may involve merely taking a nearby nonfarm job while continuing to live on the farm. Or it may mean movement to a distant city with all that this involves in the way of social and economic adjustments. Also, farm to nonfarm movements may be achieved either (a) by low-income farm people moving to jobs or (b) by development and location of new jobs and industry in low-income farm areas.

What promise these various methods hold as ways of solving the low-income farm problem depends upon (1) the labor and management capabilities and interests of the low-income farm people, (2) the nature of the supply of other factors needed to complement the human agent, and (3) the nature of the demand, or markets, for the goods and services that low-income people are capable of producing.

Based upon what they are able to do to increase their incomes, there are two quite distinct classes of low-income farm people: (1) those who because of adanced age or other conditions limiting the kind and amount of work they can do are already about as productively employed as can reasonably be expected, and (2) those who now earn less than they could in other kinds of employment or by other ways of farming. Incomes of people in the former class can be substantially increased only through income transfers or through essentially welfare methods. Income needs of people in the latter class may be treated as production and employment problems. These cover a wide range in terms of complexity of types of adjustments in which they are interested. Some are interested only in adjustments on their farm, some only in farming, some in nonfarm work only in the area they live in, and others are fully mobile.

Over a wide range of conditions, however, the differences among low-income people are far more differences in degree, and in turn ones necessitating differences in emphasis, rather than in kinds of problem solutions. In other words, for a large part of the low-income farm popu-

lation, the problem of increasing incomes is less a choice between income transfers and production or employment adjustments than how to combine these two approaches in ways that will best serve the general public interest.

Welfare-Oriented Measures

At the lower extreme, some low-income farm people, because of their advanced age, their physical or mental condition, or other factors, cannot be helped except through income transfers. There is a strong presumption that this is generally true of the recipients of old age pensions and of aid to dependent children.

For people incapable of productive employment, direct money grants are generally believed to be the most effective and least costly form of assistance. However, where the interests of children are involved, special provisions for their health and education may yield a larger social dividend than would the same amounts of aid extended in money form.

The problems of dependent people in agriculture are not essentially different than those of dependent people in the nonfarm economy. Although many of the nation's low-income people in agriculture are in this general class, this is not the population about which we are primarily concerned in the formulation of low-farm-income policies and programs.

There are many low-income people in agriculture, however, who are not dependent but who, because of age or health conditions, will not find it feasible to make major changes in their farming or employment. The income problem posed by these people is mainly that of preventing dependency or that of finding the most economical means of assisting them while they still are able to engage in productive work but after their labor capacity further declines. Because many of these people have relatively small margins of income over their subsistence needs and have but limited financial resources, it requires only such shocks as loss of a mule or a cow, an unfavorable crop season or a short period of illness, to reduce them to a state of dependency. When these conditions occur, "subsidized" credit for rehabilitating their farming business combined with farm and home supervisory assistance, to restore them to an essentially self-sustaining status, needs consideration as an alternative to other forms of relief. In the past, a large part of the resources of the Farmers Home Administration, especially in the South, has been used to service essentially this kind of need. This has sometimes been done as an alternative to providing larger loans to a smaller number of families who, with the larger loans, could make large improvements in their farming.

As we look to the future, there is no inherent reason why, in a nation as rich and as ingenious as ours, provisions cannot be made to take care

of both of these kinds of need. These two classes of problems, though, are very different, and may require markedly different kinds of programs that may best be administered by two quite different kinds of people in respect to training, interests, temperaments and abilities. Too, programs for assisting the less able farm poor admittedly have to be mainly public welfare programs.

Developing the Employment Potentials of Low-Income Farm People

As the labor and management potentials of low-income people increase and as the length of the planning period left to them also increases, production and employment adjustments may be used increasingly to supplant transfers of income. But even here, there are two distinct, yet interrelated, aspects of the problem: (1) that of developing the labor and management capacities of the low-income farm people, and (2) that of utilizing these capacities.

The former is especially important as we consider children—obviously the most valuable crop the nation's low-income farm families produce. In the better provisions for education and health of children lies the best hope we have of preventing the intergeneration recurrence of the low-income problem. Many low-income communities, however, are seriously limited in their ability to finance the schools they need—both because of their low incomes and because they have a relatively large percentage of the nation's future citizens to rear. Hence, a program of income transfers in the form of federal aid for education is now widely proposed to help children in the poorer states to become full-fledged participants in our increasingly complex economy. Federal aid, however, does not exhaust the possible remedies. There is much that low-income communities themselves can do to improve their educational facilities. The principle of federal aid has been applied now for several years in agricultural education. As a means of more nearly equalizing opportunities, federal aid in the general education field warrants consideration—this, in my opinion, without attempts to use it as a vehicle for also solving other, more controversial problems.

Resource Use Adjustments

Limitations of farm improvements

As we turn to the problem of a more efficient utilization of the labor capacities of low-income farm people, market considerations become of primary importance. Farm management studies reveal that many low-income farmers can substantially increase their incomes by appropriate changes in crops and livestock and by the adoption of more efficient

production methods.[1] However, from an aggregative view, the opportunities for solving the low-income farm problem by farm improvements alone appear to be relatively small. This is likely to remain so. In spite of expected increases in the future demand for farm products, agricultural production will likely increase at a slower rate than nonfarm production. Also, because of technological advances, agriculture's need for labor may continue to decline as it has been doing in recent years. The problem is, therefore, one for which, without considerable reduction in the number of people dependent upon farming in low-income areas, there now seems to be no solution superior to the present situation except that possible by improved self-sufficiency. By improvements in their production of food and of other goods and services for their own use, and also by community improvements some improvement can be made in the incomes and welfare of probably most of the nation's low-income farm families who remain in agriculture. Yet most of the goods and services that distinguish our level of living from that of our ancestors a few generations ago can be obtained only through money exchange. At best, therefore, improved self-sufficiency is but a part of a broader total complex of adjustments if the objective of a substantial increase in incomes of the nation's low-income farm people is to be attained.

Need for farm to nonfarm adjustments

Fortunately, reliance upon only farm improvements to raise incomes and welfare of the nation's low-income farm people is not necessary. For we have as a resource for this problem a highly dynamic general economy —one in which nonfarm civilian jobs increased from 38 millon in 1940 to more than 56 million in 1955. Many of these some 18 million new jobs have been taken by formerly low-income farm people. This is evidenced in part by the fact that out migration from agriculture in low-income states and areas has been at a more rapid rate than it has from higher-income states and areas.[2] Nonfarm jobs have represented for these people much simpler ways of increasing their incomes and of improving the opportunities of their children than were generally available to them in farming. In spite of the prospects ahead for automation, or for push-button operations in the nonfarm economy, the opportunities this sector offers for the more productive employment of the nation's low-income farm people are potentially much larger than in agriculture, because of differences in the nature of the demand for farm and nonfarm goods and services.

[1] J. George Sutherland, "Opportunities for Adjustments at the Farm Level," *Farm Policy Forum*, Spring, 1956.

[2] *Farm Population, Migration To and From Farms, 1920-54*, Agri. Mkt. Service, U. S. Dept. of Agr., 1954.

The opportunities in farming may be expected to improve as the number of people depending upon agriculture in low-income areas declines. In other words, the dynamic economy we have provides scope for and gives meaning to farm improvements, as well as to farm to nonfarm labor transfers, in an attack upon the low-income farm problem.

Local development versus out-migration

As already noted, farm-to-nonfarm labor movements may be achieved either by laborers moving to jobs and industrial centers, wherever these happen to be, or by the location and development of nonfarm enterprises and jobs in low-income farming areas. Some contend that, until low-income areas catch up with the rest of the Nation in industrial development, they will continue to lag in farm family incomes, in the development of their human resources, and in providing markets for products of the rest of the economy.[8] One can accept this general thesis, yet ask: May not such lags persist if we depend only upon industrial development in the nation's low-income farming areas, to the neglect of out-migration? The problem here, as for farm and nonfarm approaches, is not one of a choice between two methods, but of the relative emphasis to give the two in a total program cutting across both farm and nonfarm sectors of the economy. To give direction to local development, research is badly needed into the processes of economic development. Particularly, we need to determine what have been the dominant economic, social, and institutional factors in the location and development of industry. There is need, also, to gauge what industrial opportunities major low-income areas have. There is some tendency toward thinking of *rural development* in terms only of new factories and other devices to keep young people at home or to check the high rates of out-migration now observed. Yet job opportunities in all parts of the economy, as well as local industrial development opportunities, are important resources for solving the low-income farm problem. Increased realization of these opportunities represents for many localities their best means of rural development.

Special Farm Problems

The potential benefit of farm-to-nonfarm labor movements to low-income people who remain on the farm will vary greatly from area to area depending upon how the remaining farmers are situated in reference to the supply of factors needed to complement labor and management capacities. The extent to which the potential benefits are realized may

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[8] William H. Nicholls, "The South's Low-Income Problem," *Farm Policy Forum*, Spring 1956.

also turn upon a score of decisions that are outside the province of individual farm boundaries.

Farmers now in densely populated areas where the terrain is too rough for machine operations often lack the technology they need to use much more land unless the additional land is cheap enough to permit highly extensive systems of farming. The spread between present land prices and those that would permit highly extensive grazing systems, for example, may often be too large to be corrected except by out-migration beyond what can be achieved within a few years. Pending out-movements of the magnitude needed to bring land values in line with the level needed for highly labor-extensive systems of farming, land vacated in these areas by outmigrants may simply be abandoned for agricultural uses.

In areas where low-income farms are interspersed with several farms of fairly adequate size, operators of the former often find themselves unable to compete with their more fortunate neighbors for the land vacated by out-migrants. This inability grows in part out of their lack of capital to acquire the land. It grows, too, out of the lower marginal productivity of the land to them until they have bridged a sizeable gap in their nonland, as well as in their land resources, such as will enable them to adopt technologies that lend themselves to a larger scale of operations.

Tenants and share croppers in cash areas of the South who are unable to move into nonfarm work constitute another low-income group for whom the problem of raising their productivity and income is exceedingly difficult. These people have little except essentially unskilled labor as an income source. Yet the trend of farming adjustments in these areas has been toward adoption of labor-saving machinery and less labor-intensive types of farming, the effects of which have been to lessen the importance of labor. In such areas, we may have what is essentially a stranded low-income farm population about which little can be done except to relieve need and to prevent intergeneration recurrence of these conditions.

Indeed, much of the low-income farm problem presents a dilemma in the sense that many of the Nation's low-income people, because of their age or other occupational handicaps, cannot easily move into nonfarm work, yet are so situated that little can be done to raise their incomes by farm improvements.[4]

Where farm improvement opportunities are emerging (as they are in

[4] The Negro is another special problem class—one that faces, in addition to the obstacles common to all poor people, those of race. This problem class, however, is treated in another paper in this session.

many low-income areas because of labor out-movements, market changes and other factors) their realization often does not automatically follow. Rather, available evidence indicates that in many localities, large labor out-movements have been followed by but very little change in size, type, and methods of farming of the remaining farm people. As a means of hastening the processes of adjustments in such low-income areas, research into the processes and structure of major agricultural adjustments on an area-wide basis is badly needed. In the past, individual farms have been taken as the basic unit of organization in our agricultural education and action programs. Yet, in many low-income areas, relatively little can be done to improve incomes working within farm-fence boundaries alone.

Rather, as farm improvement opportunities emerge from labor out-movements or other causes, their realization may require besides very large changes in the organization and operations of farms and in their capital and other resource needs, major changes in tenure and credit arrangements, in marketing and processing facilities, in the direction of agricultural extension service and research programs, and in the facilities and operations of other agricultural service agencies—in short, changes in the whole community structure. For these reasons, in many low-income areas, major farming adjustments may often be very difficult to make except when attempted on acommunity or area-wide basis or by several farmers who are fairly concentrated rather than widely scattered. This, in general, appears to have been the pattern of development of many specialty crops and of the broiler and dairy industry in parts of the Southeast with which I am most familiar.

If we conceive of these adjustments as posing only individual farm problems of the kind that might be handed under individual farm and home planning, the chances of realizing the emerging production potentials in many low-income areas are slight indeed. Admittedly, however, the processes by which, and the conditions under which, area-wide adjustments—of the kinds that may be needed in many low-income areas—are made constitute a problem on which additional study is needed.

Public Policies and Programs To Implement Adjustments of Low-Income Farmers

Turning from further consideration of the nature of income improvement possibilities, what kinds of public programs at federal, state, and local levels do we need to implement the solution to the low-income problem? This problem has its setting in a highly dynamic national economy. It arises, too, within a society that already has many public policies and programs that, although oriented primarily to other policy objectives, now affect in one way or another the economic opportunities of the

nation's low-income farm people. Therefore, standing by and doing nothing that will affect the low-income farm problem is not among the possible alternatives now open at federal and state policy levels. Instead, the least that can be done is to leave the low-income farm problem to normal social and economic processes, meaning merely that no cognizance is taken of it in the formulation and direction of other public policies and programs. This is the policy alternative with which our nation has had the most experience. The results of it, so far as the low-income farm problem is concerned, can be seen in the persistence of chronic low incomes as a characteristic feature of large parts of American agriculture.

However, it does not follow—in spite of the showing to date—that the low-income farm problem may not yield to essentially this same kind of policy in the years ahead. For what such a policy involved even two or three decades ago, when we had a federal budget of less than 10 billion dollars, is not the same thing that it means today with the far-flung operations of government now reaching into all parts of the economy.

For instance, in the way of direct income grants, federal and state governments now provide old-age pensions, aid to dependent children, and other forms of special assistance that help to ameliorate poverty conditions among many of the nation's low-income farm people. In some states, these forms of assistance are now no longer considered as charity but as rights to which the recipients are entitled. The recent extension of social security legislation should also have special significance for low-income farm families, particularly for those who are near retirement ages.

In long established agricultural agencies, like the Agricultural Extension Service, Agricultural Research Service and the experiment stations, departments of vocational agriculture, the Soil Conservation Service, the Farm Credit Administration, and the Farmers Home Administration, we also have a powerful array of programs one or more of which reach into every farm home in the nation.[5] The activities of these agencies are affecting the relative opportunities of farm people. Although they were created primarily to serve other public policy objectives, many of the things they could do to help raise the productivity of low-income farm people are things that would complement their own special policy objectives. In the past, the potentialities of some of these agencies as resources for attacking the low-income farm problem have not been fully realized because of our failure to distinguish between the problems of low-income farmers and those common to agriculture generally, and in turn the failure

[5] For a fuller treatment of these programs and the low-income farm problem see W. W. Wilcox and W. E. Hendrix, *Underemployment of Rural Families*, Joint Committee Print, Joint Committee on the Economic Report, U. S. Congress, 1951.

to orient these programs more directly to the special needs and capabilities of the low-income farm people. Now, however, each of these agencies has a directive to consider the low-income farm problem.[6] And with proper planning and coordination of their activities at local, state, and federal levels, each can make an important contribution toward helping underemployed farm people.

Finally, as a factor of great importance, under the Employment Act of 1946, the federal government is committed to utilizing its programs and powers in a manner calculated to promote maximum employment, production, and purchasing power and to foster competitive enterprise and the general welfare. In terms of what needs to be done to achieve these goals, this is a commitment to foster continuing economic growth.

Most students consider continuing economic growth to be by far the most essential need for solution of the low-income farm problem.[7] Indeed, some suggest that it is a sufficient condition for wiping out low incomes in agriculture except as welfare problems. The persistence of chronic low farm incomes after the phenomenal growth of our economy in the last 15 years may seem to make this appear doubtful as a universal solution. We have a few areas where relatively low incomes had long persisted, however, and where in recent years with nearby rapid economic growth and relatively large differentials between labor incomes in farm and nonfarm work, the low-income farm problem is rapidly disappearing except as a problem of the aged and of persons with health conditions prohibiting their entry into nonfarm work. For example, preliminary observations in a current study in northeast Texas involving a sample of about 1,400 open country households, indicate that this situation is being closely approximated there. This is an area that has experienced large economic growth associated in large part with the oil and chemical industry, and that lies within the influence of the nearby, and very rapidly growing, Houston and Dallas industrial complex. With the income differentials obtaining under these conditions, able-bodied male workers in this locality are not remaining in agriculture unless they are able to operate farms that are large enough and well enough stocked and equipped to yield earnings comparable to, or in excess of, what they can earn in nonfarm work.

The most notable exception to this was found among Negroes who are continuing to farm. However, if comparisons were made of earnings of White and Nonwhite laborers in nonfarm jobs, standardizing the two groups with respect to sex, age, and education and excluding from both groups those reporting physical conditions as occupational handicaps,

[6] *Development of Agriculture's Human Resources: A Report on Problems of Low-Income Farmers*, U. S. Department of Agriculture, April, 1955.

[7] Karl A. Fox, "Low-Income Problems in a High-Employment Economy," *Journal of Farm Economics*, Proceedings Issue, December, 1955.

I suspect we would find that the farm-nonfarm differentials in earnings are much less for Negroes than for Whites.

With continuing economic growth, considerable progress in wiping out chronic low farm incomes, except as welfare problems, will likely be made whether or not this is held to as a public policy objective. But the rate at which this will occur will vary greatly, depending upon the nature of the economic growth and its location, upon the direction of our agricultural policies and programs, upon the future development and direction of education and research, upon the provision of a more adequate employment service for rural areas, and upon many other factors that are now matters of social control. In my judgment, therefore, what our policy objective respecting low farm incomes is and the extent to which cognizance is taken of this objective in the development and administration of other public policies and programs (including the State and Federal employment service and special programs to implement the Employment Act of 1946 as well as those with agriculture), will make an important difference for the future of the low-income farm problem.

In face of the interest shown by both Congress and the Administration and by state and local agencies, there is no doubt as to what the public interest and intent is respecting the alleviation and correction of rural underemployment. For the most part, the current emphasis is upon using existing agencies rather than upon creating new ones in attacking the problem.[8] Large reliance is also being placed upon local initiative and resources, including those in private sectors of the economy. These directions of attack, as opposed to creation of new agencies to deal with the problem, will undoubtedly require more time for corrective programs to get under way. They will result in programs that will appear much less direct in their attack, and have many features that will seem of dubious value. On the other hand, this line of attack can bring to the problem many times more resources than otherwise could possibly be directed to it. Especially will emphasis upon local initiative help bring to the task, the resources derivable out of the enthusiasm and self-drives of people in low-income areas and regions when they are awakened to their problem and to their own creative faculties for progress and are throwing their own energies behind it.

To my knowledge, there is no known formula for more fully mobilizing resources of the above kinds and for organizing them for an attack upon the low-income farm problem. Rather, the procedures for this have to be worked out through discussion and negotiation among agencies, public

[8] One notable exception is to be found in recent legislative proposals for programs to alleviate conditions of excessive unemployment in economically depressed areas.

and private, conducted in light of the best knowledge we have of the nature of the problem, in light of the resources they have, and with reference to their other interests and objectives.

DISCUSSION: SOME MYTHS OF SOUTHERN ECONOMIC GROWTH

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We have had many people write about the South in our journals in a manner relatively as truthful or untruthful as the novels or movies about the South. Marshallian economics, in the way in which it frequently has been "snapshotted" on the South, will likely not give all the answers—truthful or hoped for. Much of this analysis—inadequate or inaccurate—has been done by individuals unfamiliar with institutions of the South. A corn-hog understanding might not fit. It is refreshing, therefore, to find work such as in this paper being done by people having some familiarity with the area—by one whose only sources have not been the Census and a vacation trip.

Martin starts with the feeling that the solution of the low-income problem in agriculture is dependent upon the growth of nonagricultural industries and the integration of capital and labor markets with this nonagricultural growth. There are many agricultural bottlenecks to the joint growth.

Martin is concerned here with some problems relating to the geographical location of economic growth in the Southeast. Two propositions were suggested for testing: (1) uneven economic growth among areas is associated with labor surplus, capital-deficit problems of low-income areas and (2) agricultural areas isolated by distance and culture become disadvantaged (a) because population is relatively too great for the resources available, and (b) capital is relatively scarce.

Three myths follow: The first is that the Civil War was the cause of low income in the Southeast. This, of course, is dismissed. The second myth is that there is a major relocation of industry in the Southeast from other areas. This too is shown to be false. The third, or "new myth," is that the Southeast is becoming an industrial giant. This also has little basis in fact.

Growth of Southern industries has been greatest in the low-value-added industries. There was a decline in resource efficiency in both these and the medium-value-added industries. The high-value-added industries showed some improvement.

Manufacturing workers of the Southeast are showing some improve-

ment in income as contrasted with the rest of the nation—but Southeast incomes even yet average a third less. There is no indication that added capital investment will provide jobs needed by the population pressure.

These conclusions to a student of the South are evident. We need to have more of careful researching that gets above superficial spellbinding.

The problems of low-income areas suggest the necessity on the part of all of us of backing away from the minutia (the film grains) to see what kind of a picture we have. Perhaps in our race for publications in all of our various subfields we have become guilty of too much superficial writing.

Perhaps we need to know how peoples' goals vary among individuals and groups. We know but forget they are not all economic. We have been sharply criticized by social psychologists for neglecting group and leadership effects in market behavior but we go right along using our outdated psychology. I expect that very few who have lived in both the North and the South would claim goal patterns of these two areas are the same —they differ in items, amounts, and combinations.

There is the perpetual problem of setting up research that gets to the heart of the problem. In this area under discussion some of our usual difficulties may be greater than in most others. Stated in question form:

1. Do we know what we are measuring?
2. Do we know how to measure what we think we are measuring?
3. Are the units of measurements uniform—how can Arkansas incomes be compared with California incomes?
4. If we grant positive answers to the above, do the research results show a definite indication or answer to a real problem, or are they like another snowball in Texas?

DISCUSSION: A COMPARATIVE ANALYSIS OF WHITE AND NEGRO FARMERS IN THE UNITED STATES

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Agricultural economists in recent years have become increasingly interested in low-income problems in agriculture. As a result of this interest, many studies have been made of this complex socio-economic problem. The present study represents another attempt to analyze low-income problems and to establish its relationship to race. Since Negro farmers constitute one of the lowest income groups in the United States and since the great majority of the Negro farmers live in the South, this study is confined only to this area. Although there are other areas in the United States with low farm incomes the author ignored these areas

since his objective was to make income comparisons among Negro and White farmers in the South.

In evaluating this paper, I should like to raise three major points for discussion. They include: (1) a discussion of what I consider to be the major contribution of this paper, i.e., to indicate the weaknesses of using census data in an analysis of a problem of this nature, (2) a discussion of the concept of discrimination and of the economic form that it takes in agriculture, and (3) an appraisal of the method of imputation and subsequent analysis of factor markets (which assumes a perfect capital market) in a setting characterized by economic discrimination. There are other points that could be raised but I have attempted to confine my remarks to a general critique of methodology employed and to the relevancy and suitability of the data used.

A major contribution of this paper, as I see it, is to indicate the weaknesses of the information obtained and published by the Bureau of Census for meaningful economic analysis. Use of census data in an analysis of this nature has many shortcomings. Income is logically related to certain variables and, in order to establish the functional relationship of these variables to income, information on their distribution is needed. In order to determine the effects of variables such as capital and labor on income it is necessary to limit the variation in one to study the effects of changes on the other. Obviously, this is impossible to accomplish if census summaries are used.

The author recognized the limitations of using average income data obtained from the census but proceeded to make an analysis of farm incomes by adjusting for capital investment and education. Historically, the low-income group in the South (and especially the Southeast) has included the major portion of the Negro farm population. Part of the explanation for this fact must be related to education. However, education is only part of the answer. The small quantity of resources available for production, especially capital, is a major factor contributing to the low level of income among Negro farmers in the South. In adjusting for capital investment, the author assumed a market rate of interest in imputing returns to capital. This procedure implies that the productivity of capital is the same on all farms. Such an assumption is not likely to lead to a realistic solution of capital associated problems. The assumption of a perfect capital market is highly questionable if imperfections are assumed in the labor market.

This takes me to my second point of criticism—the economic nature of discrimination. Granted that discrimination does exist in the South; what form does it take and how can it be measured? In agriculture, it is my hypothesis that the economic form of discrimination would be expressed in the capital, as well as the labor markets. The effects of im-

perfections in the capital and labor markets on resource productivity should be more fully explored before any definite conclusions concerning discrimination can be made. For example, the extent to which landlords exercise monopoly powers in the determination of share rents should be explored to give better insights into discrimination in the labor markets. On the other hand, if the shares are flexible discrimination may be less pronounced. Evidently, the author ignored these points and merely stated that nonfarm economic opportunities are greater than farm opportunities for Negroes in the South. This information on the effects of discrimination in the labor markets concerning the efficiency of production and farm incomes appears inadequate relative to the stated analytical intentions.

My third point concerns the method of imputing returns to capital in order to obtain estimates of labor incomes. If discrimination does exist in the South (which the author assumes that it does), then the assumption of a perfect capital market is inconsistent with reality. Consequently, any subsequent analysis based upon a perfect market gives meaningless results. It would have been just as logical to have assumed a wage rate and estimated the returns to capital. Obviously, then, the family labor incomes obtained by this procedure do not offer a sound basis for making comparisons between Negro and White farmers in the South. Using the same rate of return for capital on both groups of farms when combined with different quantities of labor assumes constant productivity of capital. Using different returns on capital can alter labor income and thereby lead to different conclusions. The range in the market rate of interest used by the author in no way represents the true picture of the productivity of capital; it means that these were the only ones tried in this study. Even if one ignores the limitation of the imputation procedure in estimating factor returns, a functional distribution of income in actual use is of little importance, especially from the standpoint of decision making.

One of the major objectives of this paper is to isolate the effect of race from the numerous circumstances affecting farm income so that labor income can be estimated to determine if there was in 1949 greater or less discrimination against Negro farmers than against Negroes in other occupations. I do not find in this paper any attempt to establish the extent to which discrimination against Negroes in nonfarm occupations is carried on. Therefore, I fail to see how any tentative conclusions, relating to the degree of discrimination in farm and nonfarm occupations, can be made since there is no basis for comparison given. On the basis of comparison given, it is highly conjectural that any classification of Negro and White farmers of comparable labor market capacities can be made. Labor capabilities may or may not be a criterion of labor income. The manner in which labor is combined with land and capital influences the productivity of all resources.

An alternative approach to an analysis of a problem of this nature

would be to consider a homogenous sample of farms stratified with respect to farm size, education, type of farming, and quality of land. Results from an analysis of these data would give a more accurate basis for comparison of Negro and White farm incomes. Also, an analysis of nonfarm incomes for Negroes would be desirable so that a comparison of the relative income opportunities could be made. As indicated earlier, it would be desirable to determine the nature of discrimination and its effects on the factor markets. It may be that nonfarm job opportunities in the South have increased for Negroes enough to cause farmers to leave the farm. This may explain the present decline of Negro farmers as a percent of all farmers and the ratio of Negro farmers to other occupations. The decline in the latter ratio could have come about by the Negroes in other occupations increasing relative to Negro farmers, thereby, causing a decline in this ratio. If this be true, then the decrease of the percent of Negroes of all farmers is not entirely explained by the exodus of Negroes from the South.

DISCUSSION: WHAT TO DO ABOUT LOW INCOMES IN AGRICULTURE

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The title of Dr. Hendrix's paper "What To Do About Low Incomes In Agriculture" may have suggested to you as it did to me that here would be a program proposal for alleviating and correcting the conditions associated with or causing the low-income situations in agriculture. This is not the task Hendrix sets for himself, however. He proposes to outline and analyze "in broad general terms the major low-income policy alternatives now open to us," to stimulate further thought and study "in the development of low-income farm policies at federal, state, and local levels." As with most economists his task has to do with increasing incomes of low-income farm people.

With my limited experience and contact with this problem, I have the impression that the objective is accomplished in a thoroughly inclusive manner. Although I do not pose as an expert on the problem or even as an original thinker I find little in this discussion to question or in need of further amplification. Although I might just be a bit lavish in commendation to the author and let it go at that I'm reminded of the wife at a baseball game who asked her husband why the crowd was cheering so excitedly over the performance of an outfielder. The husband explained that he had just caught a fly ball to which the wife replied "Well that's what he is out there for isn't it."

I am acquainted to some extent as most of you are with previous work

of Hendrix in this field. I am sure the program committee chose him to make the presentation because they would expect him to make a play the crowd could approve.

In studying an advanced copy of the paper I was impressed with a design of thought and presentation that runs through it. We might suppose Hendrix would classify the farm people into two groups, those who have adequate income and those who have low income. He has no concern with those having high incomes but for the low-income group there are two possible ways of increasing income: by income transfers or by increasing production. He looks upon income transfers as having a place in certain situations but generally less desirable for the main problem. As to increasing production he sees two alternatives: either by improvements within agriculture or by changing kinds of employment. The former he seems to think offers only limited possibilities and as to the latter their are only two possibilities: either the low-income people move to new jobs or that new jobs be established in their area. In either case the low-income people present two problems: problems arise either from limited ability because of age, physical condition and the like or from underemployment of those who are capable of doing more. In the former case there isn't much you can do but in the latter case there are two aspects of the problem presented: that of developing the labor and management capacities of the people and that of their utilization. Then in the final analysis you only have two alternatives for implimenting the policy, that of using existing agencies or that of creating new agencies.

This pattern reminds me a bit of the explanation of why one should never worry. Everything that concerns you can be resolved into the fact that you are either happy or you are unhappy. If you are happy there is nothing to worry about, but if you are unhappy then there are only two things you need be concerned with: you are well or you are sick. If you are well there is nothing to worry about but if you are sick there are only two things that can concern you: you will either get well or you will die. If you get well there is nothing to worry about but if you die there are only two things to concern you: you will either go to heaven or you will go to hell. If you go to heaven there is nothing to be concerned about and if you go to hell you'll be so busy shaking hands with old friends you won't have time to worry anyway.

If you hold me to this story you might conclude that I would suggest one alternative to handling the low-income farm problem would be to leave it alone and expect the situation to be improved as much as it need be through the free operation of a free economic system. Although this view is held by some, I do not subscribe to it and certainly Hendrix does not. My interpretation of his philosophy is that action can be taken to

improve the income of the low-income group and that if we want to solve the problem we can do it.

To return to the summary of Hendrix's statement it should be stated as he points out toward the end of the discussion, the one-two classifications he presents are not always mutually exclusive. The solution to the problem would take the well-directed efforts of the many who now have an interest in it. I think this might also be interpreted to mean that up the line where alternatives are listed there would also be a third alternative in many cases, that of a combination of the two. For example, I would think that worthwhile gains would come by having available job opportunities as well as means to improve production on the farm with resources the low-income people might have.

The discussion makes the point that one of our better hopes in dealing with the low-income problem is to be interested in better education and health of children which are characterized as being "the most valuable crop the nation's low-income farm families produce." I feel sure this point would strike a receptive chord with most persons who have worked with this group of people. This approach has been advocated by some for a number of years and seems to get to the heart of the problem. Although it hasn't had the partisan political attention it now gets as federal aid to education, it has been and remains a potent consideration. Hendrix would advocate federal aid in the general education field and this without any string attached or attempts to use it as a means of solving other problems.

Hendrix divides the farm people of the low-income group into two classes based upon what they are able to do to increase their income: "(1) those who because of advanced age or other conditions limiting the kind and amount of work they can do are already about as productively employed as can reasonably be expected, and (2) those who now earn less than they could in other kinds of employment or by other ways of farming." My experience leads me to believe that the second class needs to be divided according to location. Underemployed people in a low-income area present a different problem than underemployed people in a high-income area. They are low-income for different reasons and the solution to their problem is different.

As I interpret the paper, programs aimed at a solution to the low-income problem must be made with the least disturbance to established mores, customs, and institutions of the people involved. To attempt to operate against these conditions would only invite difficulty and maybe failure. This is a very important consideration. Back in the land purchase and resettlement days the people of a very low-income community were finally pursuaded to submit to resettlement to better areas. They couldn't be moved in a group to one new area so they were resettled in a number

of areas. They had their customs and habits of thought and actions. They had their value concepts tied to what they had known and their kinships and friendships established. They didn't fit into the new communities. They weren't contented nor happy and in a matter of a short time they disappeared from the new communities. Investigation found them re-established in the old low-income area but satisfied and willing to live under the difficulties that were there.

In a reservation area in Utah, authorities of an agency had a small and modest house built for each of the Indian families that was to inhabit the reservation. The families moved in but in short order pitched their teepees back of the house, chopped the wood floors for fire wood and turned the house over to ponies, chickens and dogs.

Hendrix raises the problem of who would be in a position to acquire and utilize resources vacated by out-migration in some densely populated low-income areas. There are areas in Utah that might be classed as low-income areas although the recent USDA study didn't so regard them. During the war when job opportunities at defense installations were abundant many low-income families did leave the farms for jobs outside the area. Where the land was acquired by the more fortunate neighbor and the farmstead—such as it was—destroyed, the shift was permanent. Where the land was acquired by the less fortunate neighbor and he tried to operate the increased land base with the same inadequate capital he had before, the shift was only temporary. Where the farmstead remained in tact, the former occupants moved back when the lush part of the job opportunities was ended and the low-income operator who remained in the area was generally very willing to relinquish the new hold. Out migration didn't accomplish much unless the remaining operators had adequate capital and know-how to operate the consolidated unit.

In considering adjustments that might need be made where correction of the problem takes the form of out migration, Hendrix makes the point that community or area-wide adjustment must be made if improvement opportunities are to be realized. He cites "the pattern of development of many speciality crops and of the broiler and dairy industry in parts of the Southeast" as being examples of this problem. A county agent in a similar area claimed for himself the title of being a "social engineer" and thought of his work as being one of attempting to change the whole economic and social organization of the area. I thought that he was cutting out a task for himself that no one could or would be associated with. When one considered the adjustments that would need to be made in the area I think his concept was correct. I think it is the type of adjustment Hendrix is speaking about. I am impressed with the magnitude of the job and see it an essential.

RESEARCH METHODS IN PRICE ANALYSIS

Chairman: O. W. Herrmann, Agricultural Marketing Service, USDA

DEMAND AND QUALITY PREFERENCES FOR DECIDUOUS FRUITS

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State College of Washington

Background and Objectives

IN THE summer of 1953, the technical committee of the Western Regional Fruit Marketing Project (WM-2) embarked upon a major study of factors affecting retail sales of deciduous fruits.[1] We shall make no attempt in this paper to review the background of the study or the literature pertaining to our topic. We shall simply present the nature of some of the results of that research, particularly for peaches.

The objectives of the study were to measure the effect of "quality-appearance" factors on retail sales of deciduous fruits, to measure the effect of price on retail sales of deciduous fruits, and to measure the effect of prices of other fruits on the sales of particular deciduous fruits. Thus, we wished to obtain measures of demand elasticity, of cross elasticity, and of shifts in demand associated with "quality-appearance" factors of the deciduous fruits.

If one should ask why we were so ambitious as to attempt three major objectives at once, let us hasten to point out that the consumer selecting fruit in the retail store is faced with the complex of the price of a given commodity, prices of competing products, and the quality appearance of the fruits on display. A study with a more limited objective must take into account the other influences.

The Data

The period of the study was thirteen weeks, from the last week of June through the third week of September 1953.

Denver was divided into three geographical areas—South, Northeast, and Northwest. From the names of all stores (a total of thirty-five for the city) that were comparable in size to Safeway's 1953 standard-type store, four were selected at random in each area. Alternates were similarly selected. The twelve stores in the study represented five different chains, four stores of each of two chains, two of a third, and one each of two chains.

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[1]This research project was planned and conducted under the Western Regional Marketing Project WM-2 in cooperation with the Agricultural Marketing Service, USDA. C. R. Creek, Colorado A & M College, conducted a pilot study in the summer of 1952. Richard Foote, AMS, advised the committee regarding analysis. D. B. DeLoach, AMS, and Wendell Calhoun, AMS, gave valuable advice and assistance in setting up the study. Data were gathered by personnel of AMS, Colorado A & M, and State College of Washington. Analysis of the data has been the responsibility of the State College of Washington.

Our data consist of daily records of variety, price, and quantity sold for each fruit, berry, and melon on fresh fruit display in twelve supermarkets of Denver. These were supplemented by a daily record made by a trained observer of the following quality-appearance factors for each of the deciduous tree fruits:

1. Percentage of fruit on display that was (a) hard (green), (b) firm, (c) ripe, or (d) overripe.
2. Percentage of fruit on display that was (a) extra in color for variety, (b) normal in color for variety, or (c) low in color for variety.
3. Percentage of fruit on display that showed (a) no defects, (b) slight defects, or (c) moderate or severe defects.

Three classes of defects were noted: (1) withering, (2) decay, and (3) blemishes, bruises, or cuts.

4. Percentage of fruit on display in each of several size categories. For apricots, cherries, plums, and prunes, size was measured in ¼ inch units; for apples, peaches, and pears, in ½ inch units.
5. Square feet of display.
6. Method of display: bulk-placed, bulk-jumbled, in wholesale container, and consumer pack.
7. Maintenance of display: extra, normal, or poor.

Each percentage was recorded in the nearest 10 per cent.

Considerable discussion preceded the adoption of this set of ratings of "quality-appearance" factors. Cravens[2] in a previous study had given quality of apples an observer's rating of 1 to 9 in which 1 represented the poorest; 5, average; and 9, the best. Also, the over-all appearance of the apple display was rated from 1 to 9 in relation to the rest of the fruit display. Creek,[3] in the summer of 1952, in a pilot study of 2 stores in Denver, rated each of six quality-appearance factors on the 1 to 9 scale. The six factors were extent of display space, color, ripeness, condition, size, and method of display. The WM-2 committee discarded this rating scale because of the problems of defining the meaning of each rating and of maintaining comparability of ratings among various observers.

Foote had shown that quality-appearance ratings on the 1 to 9 scale were subject to multiple-regression analysis. However, with the recording of the factors in percentages of the fruit showing each gradation of quality appearance, analysis was more complicated. A quality-appearance matrix was suggested by Foote.[4] Since we had three measures of color,

[2] M. E. Cravens, Jr., *Retail Merchandising of Apples in Studies in Midwest Apple Marketing*, North Central Regional Publication 29, Michigan Agricultural Experiment Stations Special Bulletin 378, June 1952, and M. E. Cravens Jr., *Methodology in Studies of Retail Food Sales*, Michigan Agricultural Experiment Station Econ. Mimeo 527, May 1953.

[3] This pilot study is described in Richard J. Foote and Karl A. Fox, *Analytical Tools for Measuring Demand*, Agricultural Handbook No. 64, AMS, USDA, January 1954, p. 71.

[4] Richard J. Foote, "Use of Mathematics and Econometrics—Discussion," *Journal of Farm Economics*, Vol. XXXVI, No. 5, December 1954, pp. 858-60.

% extra, % normal, and % low, and since these three total 100%, the use of two of them, % extra and % low, in a regression analysis would give a satisfactory indication of the relation of color to scales.

Measure of Sales Used in Analysis

Our objectives are to measure the effect of changes in price of the commodity, prices of other fruits, and quality-appearance factors on sales of specific fruits. But what measure of sales? Stores vary in volume of fruit sales. Daily variations in fruit sales are associated to a large degree with numbers of customers. Cravens met the problem of variation among days of the week by constructing an index of sales for each Monday based on the average Monday sales of that store and similarly for each day of the week. This method is laborious and makes comparisons among days difficult.

Pounds per 100 customers has been used as a measure, but this required a cash register customer count that was unavailable in one store, and it requires that such counts be comparable among stores. Cravens lists two other measures suggested by Houseman: pounds of apples per pound of fruit other than apples and dollar sales of apples per dollar sales of fruit other than apples. Foote combined these into one measure by relating pounds of the particular fruit to the dollar sales of all fruits (q/v). Such a measure tends to correct for variations in total fruit buying among days or among stores. It also avoids using a value of sales of a specific fruit as the dependent variable in an analysis in which the price component of that value is an independent variable. However, the q/v measure can involve bias.[5] In this study an index of sales was constructed of the following form:

$$\frac{q_1}{q_0} \Big/ \frac{\Sigma P_0 Q_1}{\Sigma P_0 Q_0}$$

[5] Consider a hypothetical case in which Fruit A has the same elasticity of demand as the aggregate of all fruits. Consider, also, the price of Fruit A to be perfectly correlated with the average price of all fruits.

Fruit A			All Fruits		
Price (¢/lb.)	Sales (lbs.)	Value of sales ($)	Price (¢/lb.)	Sales (lbs.)	Value of sales ($)
10	100	10.00	10	1,000	100.00
15	90	13.50	15	900	135.00
20	80	16.00	20	800	160.00

Price	Pounds of Fruit A per pounds of other fruits	Value of Fruit A per dollar of other fruits	q/v
10	0.11	0.11	1.00
15	0.11	0.11	0.67
20	0.11	0.11	0.50

The q/v measure indicates change whereas the other two measures do not.

in which q_1 = pounds of a specific fruit sold in a specific store on a specific day,

q_o = average daily sales of that fruit in that store for the season,

$\Sigma P_o Q_1$ = value of fruit sales in that store on that day at average prices, and

$\Sigma P_o Q_o$ = average daily value of fruit sales in that store for the season.

Thus, $\frac{q_1}{q_o}$ puts the independent variable in relative terms. It shows the fluctuations of sales about the average daily sales of the fruit in question during those days it was sold throughout the season. Putting the independent variable in these terms tends to eliminate the effect of differences in the size of store. The index in the denominator (i.e., index of daily sales) tends to eliminate the effect of the day-to-day variation in the volume of sales throughout the week.

Two sources of variations in the data were removed by the use of relatives and indexes. A decline in customers in the middle of August is noticeable, presumably as a result of vacations. Also, a decline in fruit demand per customer is evident. We suspect that the decline in demand per customer in the stores studied results from a shift in the purchasing of fruits from supermarkets to roadside stands and fruit markets, since local fruit came on the market during this period (Figure 1). To the extent that these factors influence q_1 and Q_1 to the same degree they are not reflected in the sales index.

Measures Used of Other Variables

Our analysis assumed that the customers in each store were faced with the complex of price and quality-appearance relationships that for peaches might be arrayed as follows:

		Percentage of peaches on display that:		
Attractiveness of appearance of peaches	Maturity	were *hard (green)*	firm	*ripe*
	Color	were *low color* for variety	normal	*extra color* for variety (blush)
	Defects	had moderate or *severe defects*	slight defects	*no defects*
	Size[1]	were *small*	medium	*large*

Display space given to peaches.....*in square feet*

Attractiveness of price of peaches.....*in cents per pound*

of alternative fresh fruits and melons.....*in index of prices* $\left(\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0}\right)$

where p_0, p_1, and q_0 refer to the price and quantity of individual fruit. The subscript "o" refers to the average and "1" refers to actual price.

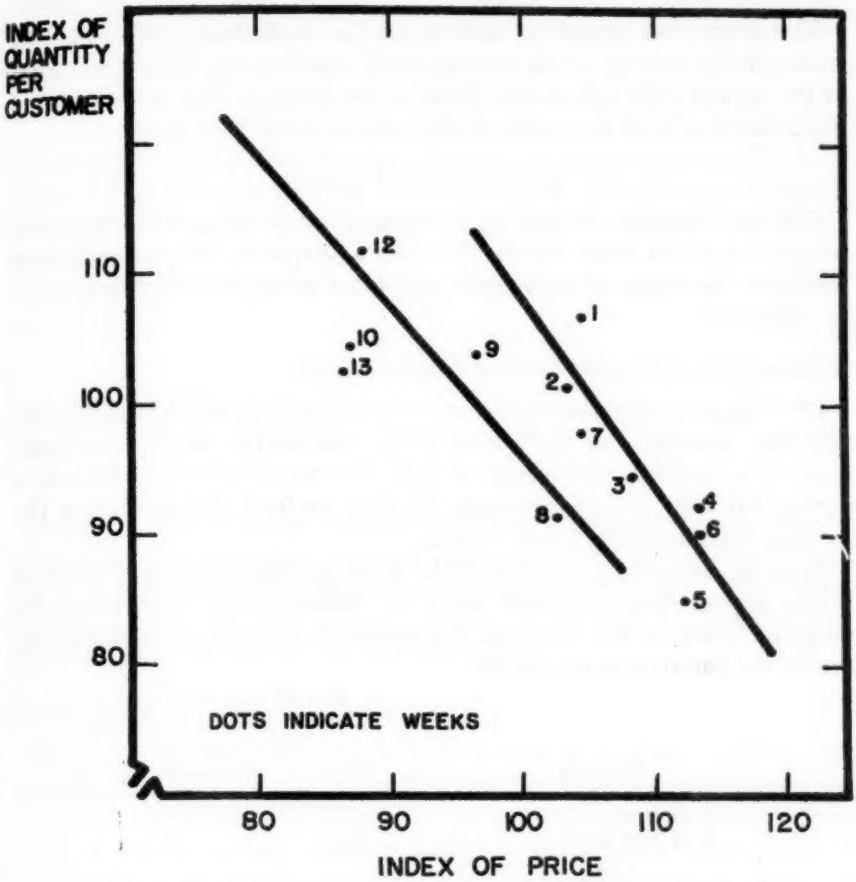

FIGURE 1. PRICE-QUANTITY RELATIONSHIP OF ALL FRUITS, 12 DENVER SUPERMARKETS, SUMMER, 1953.

Method of Analysis

The italicized factors were used as independent continuous variables in a covariance analysis. The discrete variables within which the multiple-regression analyses were made were store, week, and day of the week. The analysis for each store was essentially a time-series analysis with the variability due to the week of the season and the day of the week. The analysis for each day of the week (i.e., all Monday data, etc.) was also a time-series analysis, but included the variability among stores as well as the variability by week of the season. The analysis for each week includes the variability between stores plus that between days of that week. The study of all peaches, therefore, involved thirty-two multiple-regression analyses: one including all observations, twelve stores, thirteen weeks, and six days of the week.

The regression equations and regression coefficients were tested for homogeneity among stores, among weeks, and among days. Our results as yet do not fully reflect this phase of the analysis. Due to limitation of time, the details of this analysis will not be dealt with here.

Some Tentative Results

Due to difficulties in getting computing work done, our analysis has progressed much more slowly than we anticipated. We can give some results in the nature of an interim report and which is not yet fully tested or explained.

Influence of quality-appearance factors on sales

Of the quality-appearance factors included in the analysis of all peaches, only the percentage of fruits with extra color for the variety was significant.[6] The average percentage of fruit with extra color was 6.0 with a standard deviation of 14.5; in many displays, no fruits had extra color. The net regression coefficient was +.3282.

From the lack of significance of the other quality-appearance factors, it would appear that consumers were not influenced by them within the range of factor on the displays. The standard deviation indicates the nature of the variation in the factor.

	Size of and variability in quality-appearance factors of all peaches	
Maturity	Mean	Standard deviation
% of hard fruit	17.9	20.1
% of ripe fruit	35.4	26.3
Color		
% with low color	14.0	23.7
% with extra color	6.0	14.5
Defects		
% with no defects	77.1	15.5
% with moderate or severe defects	3.2	5.8
Size[7]		
% of small peaches	6.3	14.7
% of large peaches	0.9	4.2

There was only a limited number of displays of peaches with a quality appearance assumed to be discouraging to consumers—i.e., with a large proportion of green fruit, of low-colored fruit, of fruit with severe cuts or bruises, or of small fruit.

[6] The 5 % level of probability was chosen as the level of "significance" in this paper.

[7] Size classes for peaches were defined as follows: small—under 2 in. in diameter, medium—2 to 3 inches, and large—over 3 inches.

However, it must be recognized that in the all-peach analysis; Elbertas, Hales, and Rio Oso Gems were combined. In the separate analyses of Elbertas and Hales, other quality-appearance factors were significantly associated with sales. In the Elberta analysis, the percentages of fruit with extra color and with low color were both significant, as was the percentage of small peaches. For Hale peaches, the percentage of ripe peaches and the percentage of large peaches were significant. Whereas ripe peaches were positively associated with sales, large peaches were negatively associated.

In the analysis of apricot sales, significant quality-appearance factors were as follows:

	b	σ_b
Percentage hard	−1.06	(0.49)
Percentage with extra color	+3.39	(1.00)
Percentage with moderate and severe defects	−2.24	(1.12)

In the analysis of sweet cherries, the only quality-appearance factor testing significant was the percentage ripe; and the relationship was negative. Over-all, the quality-appearance factors had a smaller effect than was anticipated. This may be due, in part, to the fact that unattractive fruit that tended to reduce sales was discarded.

Size of display

Size of display was positively related to sales of peaches, apricots, and sweet cherries. The relationship raises questions of cause and effect. Do larger displays induce consumers to buy more? Some controlled experiments of merchandising indicate that they do. On the other hand, a produce manager anticipating demands may provide display space in relation to his expected sales, for if sales do increase, larger displays are necessary if more frequent refilling is to be avoided. Our analyses point to a positive relationship between the two and our feeling is that it is a relationship with causation working in both directions. To the extent that causation is from anticipated sales to display space, the relationship robs from some other factor, either within or outside our analysis, that is actually shifting the demand. However, large displays attract attention and would, therefore, tend to increase impulse buying.

Elasticity of demand

For all peaches, the elasticity of demand was −0.54 with the elasticity ranging from −0.34 to −0.82 for the individual weeks in which the net regression of sales on price was significant. The weekly means of price and quantity, however, can be fitted with a regression with an elasticity

of −2.69 (Figure 2). An analysis of the weekly quantity data, on which prices of other fruits were held constant, yielded an elasticity of −3.21.

Whereas all peaches had an elasticity of −0.54 in the total analysis, Hale peaches and Elbertas each had an elasticity near unity, Hales with −0.95 and Elbertas, −1.19. Such results would indicate a substitution of

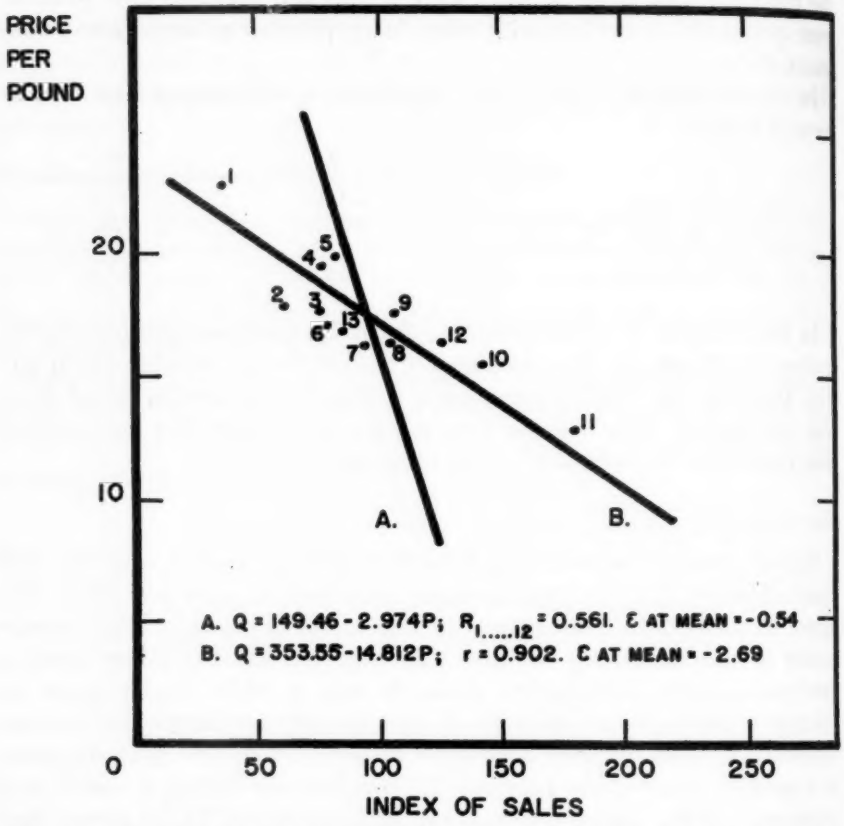

FIGURE 2. COMPARISON OF REGRESSIONS OF PEACH SALES ON PRICE OBTAINED FROM ALL STORE-DAY OBSERVATIONS (A) AND FROM WEEKLY MEANS (B).

varieties. In the analysis of sales of each variety, the sales index of the other peach was included as an independent variable. At times, only one peach was for sale in some of the stores. Hence, a number of zero observations occurred for that peach. It was for this reason that quantity index rather than the price index was included. The price index must go to infinity when none of the fruit is available. In the Hale analysis, Elberta sales had a net regression coefficient of −.215. As yet, the Elberta analysis

is not complete, but a series of weekly analyses yields coefficients of .12 to −.25 for the sales index of Hales.

The elasticity of apricots was −0.76 and of sweet cherries, −1.28. These elasticities are greater than for all peaches. Thus, the elasticity of the fruit that forms a more stable element of the diet appears to be less.

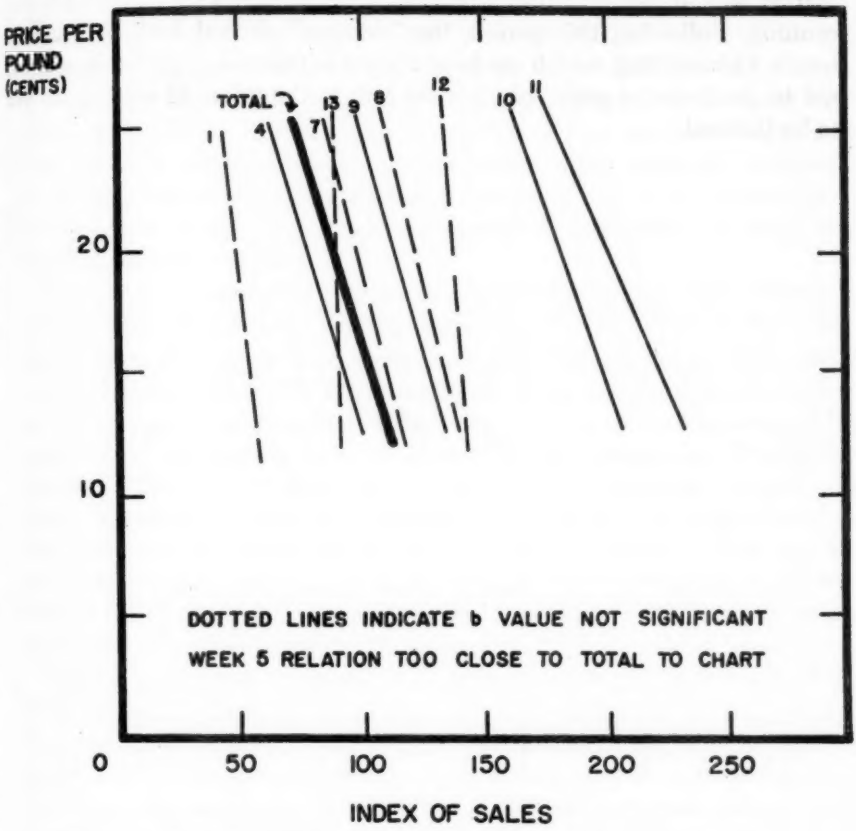

FIGURE 3. PRICE-QUANTITY RELATIONSHIPS OF ALL PEACHES, BY WEEKS. (ALL OTHER VARIABLES CONSTANT AT THEIR SEASON AVERAGES)

Effect of prices of other fruits

An index of prices of other fruits was included in each of the analyses. In apricot and cherry analyses, this index was positively related to the sales of the individual fruit. For peaches, however, the index was negatively related to sales. This requires further study, since study of the data aggregated by weeks indicates a positive relation.

An examination of Figure 3 points out that our analysis has not included all of the "demand shifters" for peaches. When all other variables are held constant at their season averages, in successive weekly analyses, the price-quantity relationships shift significantly. Particularly marked are the shifts in weeks 10 and 11 when the Colorado peach crop came to market and many consumers bought them by the lug, presumably for canning. Following this period, the "demand" shifted back to previous levels. This shifting, which we have not yet explained, is probably related, not to the index of prices of all fruits but, to the prices of some fruits yet to be isolated.

SOME ECONOMIC EFFECTS OF SUPPORTING FEED GRAIN PRICES*

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PRICE support programs for feed grains have been in effect since 1933, or nearly a quarter of a century. Specific features have differed considerably over this period, ranging from production incentives during the war to acreage allotments and other means to shift resources out of feed grain production. In general, the program attempts to even out variability in available supplies, due mainly to varying yields, by a government storage program in conjunction with price supports. However, changing conditions require frequent reappraisal as to the adequacy of the program in meeting its objectives and consideration of alternative price support approaches.

This paper attempts to provide a framework for demand analysis in support years that is useful in understanding the basic factors that affect the utilization of grain between government storage and normal market outlets. In this connection, consideration is given to reasons for deviations in the average price received by farmers for corn in the November-May period from the support level announced by the Commodity Credit Corporation (CCC.) From these results it is possible to indicate, roughly, the probable effects of changes in demand conditions and the support level on the utilization and prices of grain with a given supply of feed concentrates. The supply response to these changes also would need to be considered in any thorough analysis of alternative programs, but such an appraisal is beyond the scope of this paper.

Instead, this paper is restricted to quantification of the over-all effects of the program, considering all feed grains as an aggregate. For convenience, the price of corn is taken as representative of the price of all feed grains, as done in previous studies.[2] The following assumptions are made throughout the analysis: (1) Quantities of current-crop grain placed under loan are defined to include only amounts placed under loan and not redeemed as of May 31 for corn and March 31 for oats, barley and sorghum grains, plus quantities of purchase agreement grain delivered to CCC or placed under the support program. (2) Grain placed on the market by CCC from previous crops has the same effect on market prices as any

* The views expressed in this paper are those of the author and do not necessarily reflect those of the Agricultural Marketing Service.

[1] The author gratefully acknowledges the helpful suggestions of Richard J. Foote, Malcolm Clough, and Anthony S. Rojko of the Agricultural Marketing Service. A more complete treatment of this topic is in preparation for later publication.

[2] See, for example, Richard J. Foote, *Statistical Analyses Relating to the Feed-Livestock Economy*, U. S. Dept. of Agr. Tech. Bul. 1070, 1953, pp. 41.

addition to free supplies. (3) Quantities withheld from the market (stocks owned by CCC plus old-crop grain resealed, as of the dates specified) do not affect the November-May average price of corn. (4) These seven months represent the season average, so that influences of the next year's crop need not be included. (5) Shifts in demand are reflected by changes in the November-May average price of livestock and livestock products and the number of grain-consuming animal units fed during the year beginning in October.

Short-run adjustments in animal numbers and quantities fed per animal to sudden changes in prices and supplies of concentrates are not adequately specified in the model. Also, the effects of technological changes in grain, forage, and livestock production are difficult to quantify.[3] These limitations must be considered in interpreting the results of the analysis.

This study includes (1) a theoretical model of a fully effective support program under certain restrictive conditions; (2) the effects on this model of relaxing certain conditions; (3) a statistical estimation of the demand for feed grains in years for which the price support program is believed to have had little effect on the market price of corn; (4) a statistical estimation of the quantity of current-crop grain placed under support; (5) a graphic analysis of the market price of corn in relation to the CCC announced support level, related quantity variables, and the level of demand for feed, for 12 years in which large quantities of current-crop grain were placed under support; and (6) certain tentative conclusions as to the influence of stocks owned by CCC on the market price of corn.

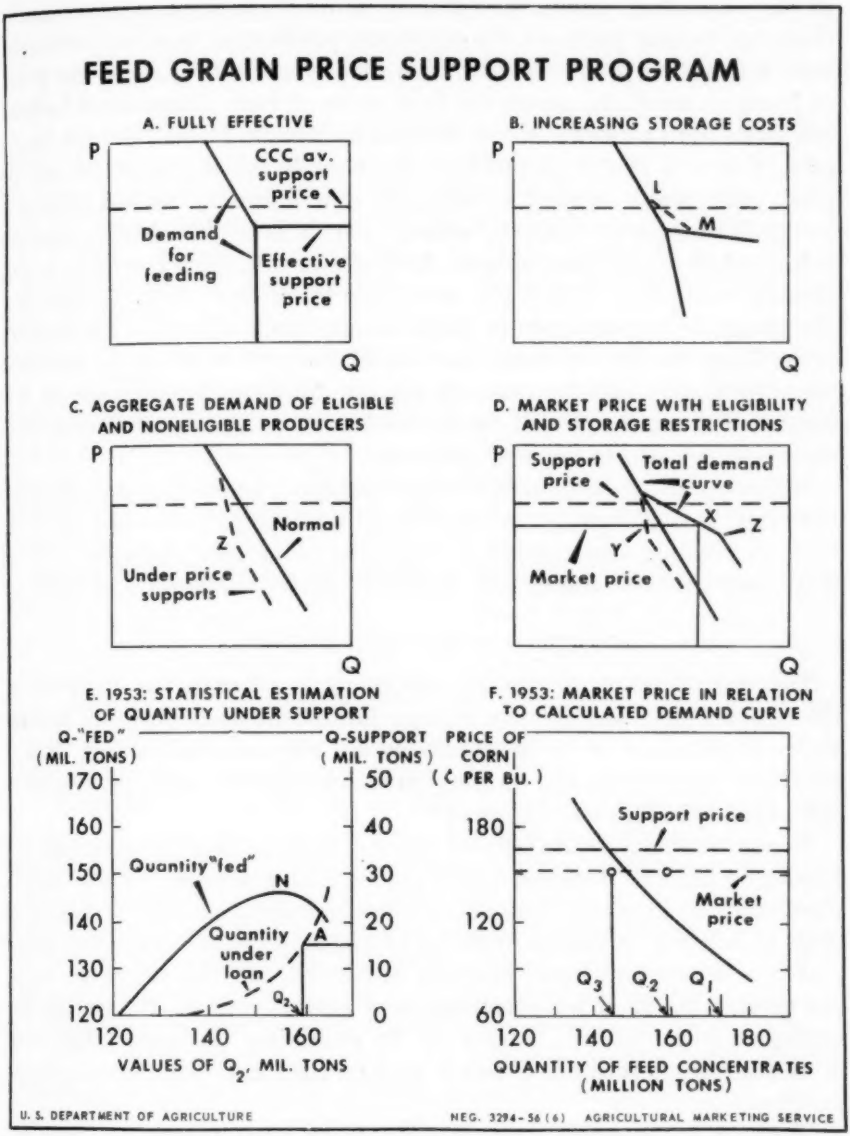
Theoretical Model of A Fully Effective Price Support Program

If certain market equilibrium conditions exist, the season average price received by farmers should equal or exceed the "effective" support price. An effective support price, as distinguished from the CCC announced support level, allows for interest on loans and the opportunity cost of using existing storage facilities or construction costs of new storage. If the program imposed no limitations as to eligibility and if adequate storage facilities on the farm always were available, the effective support price would approximate a fixed percentage of the announced support price.[4]

Let us specify conditions under which the support program would be entirely successful. We assume (1) that producers attempt to maximize profits from the disposal of their grain through three alternative outlets–

[3] For a comparison of the average rate of feed conversion efficiency over time, see Orlin J. Scovill, *Medicated Feed as an Economic Factor in the Livestock Industry*, U. S. Agricultural Research Service, 1956, pp. 10.

[4] Assuming that interest and construction costs increase proportionally with the general level of prices and supports.



sales on the market, placement under loan, or "sale" through livestock products, (2) that anticipations as to livestock prices are correct, (3) that either no eligibility restrictions are in effect, or all producers cooperate in the program, (4) that grain quality is the same in each year, and (5) that only the usual seasonal rise in prices occurs from November to May.

If demand keeps the farm price higher than the effective support price, no quantities of current-crop grain will remain under support at the end

of May. Livestock producers will feed, under these perfect market conditions, up to that point on the aggregate production function associated with a marginal productivity of corn that, when multiplied by the price of livestock products, equals the farm price of corn. However, if farmers are faced with a relatively low demand in relation to available feed supplies, they will find it profitable to cut back livestock production and to place grain under support. In this case, equilibrium is reached when the marginal revenue productivity of corn equals both the effective support price and the farm price of corn. As is shown in Figure 1, section A, the demand for feeding is perfectly inelastic at the effective support price, but the government guarantees to purchase any grain offered at the support price. Thus, the total demand curve is kinked at this point and becomes perfectly elastic, and the quantity placed under support depends on the combined demand for feed by livestock producers, normal storage, and exports in relation to given supplies of total concentrates.[5]

In this model, we assume that adjustments can be made in animal numbers and rates of feeding corresponding to the long-run production function. In practice, the rapidity of this adjustment varies by type of livestock and between changes in livestock numbers and rates of feeding.

Effects of Special Conditions

Two conditions seem especially important in affecting the operation of the support program, namely storage limitations and eligibility restrictions. Implications of these conditions are discussed below but, in any statistical estimation, the varying provisions of the support programs since 1933 introduce complications.[6]

Storage limited. Availability of storage facilities has an important influence on farmers' decisions to sell grain or to put corn under loan. Introduction of the increased costs of providing storage once the crop becomes large in relation to storage facilities results in an effective support price that is a negatively sloped function of supply—i.e., the larger the crop, the greater the need for construction of new storage by farmers in the aggregate (see Figure 1, section B). By definition, the opportunity cost of *excess* storage facilities is nearly zero on the farm. Naturally, capacity

[5] An implicit assumption is that the demand for total nonfeed uses, including commercial storage, has an elasticity equal to that for feed uses.

[6] Changes in general provisions include the period for which loans are available, discounts for moisture content, flat or graduated loan rates, and introduction of the purchase agreement program. Varying requirements for *eligibility* include whether or not acreage allotments or conservation provisions are in effect. Changes relating mainly to *storage* include the introduction in 1949 of provision for warehouse-stored grain whereas previously only farm-stored grain was allowed. Also, the resealing program adds the complication that it may be more profitable to reseal old corn than to use the storage capacity for current-crop grain.

is more apt to be in excess when crops are below average, whereas for bumper crops, provision of storage required for grain under loan may not be feasible.

In the actual operation of the program, the market price may about equal the support price in years of small or medium crops, especially if the crop is above average in quality. Also, farmers may take out loans to obtain an assured price and, once the grain is committed, may not redeem the loan even though the market price is slightly above the support price. In addition, if the market price is rising at the end of May (the arbitrary cut-off point for this analysis) and loans can be redeemed until the end of July, farmers may keep grain under support after May with the hope of selling at the high point of the market—the reasoning being that by July the size of the following crop is fairly well known and, if short, it would be more profitable to sell on the market than default on the loan. Thus, in some years, the market price is above the support price and grain is still under support as of May 31. This is illustrated by the dashed curve LM in Figure 1, section B.

Storage limited, eligibility restricted. Eligibility for the loan program also affects the quantity of grain going under support with a given sized crop in relation to demand. If producers, for example, are not eligible because of overplanting their acreage allotments, availability of corn at less than the support price would tend to increase animal units or result in heavier feeding of livestock on hand, or both. The quantity going under support by eligible producers cooperating in the program would then be a function of the quantity of corn *they* have in excess of the most profitable level of feeding. In this case, the aggregate demand for feed of eligible and noneligible producers is more inelastic than in years of nonsupport in feeding ranges associated with market prices below the support level. That is, eligible producers have an inelastic demand for feeding at a price below their effective support price, similar to that shown in Figure 1, section A, and noneligible producers feed livestock according to a demand curve that would prevail if there were no support program.

If the market price falls below the effective support price, however, eligible producers may find it profitable to purchase grain (and possibly put additional quantities under support) and increase their feeding operations. To the noneligible producer, the strengthening of the market price by purchases of eligible producers acts as their support price. Thus, the net effect is that the demand curve for feeding becomes less inelastic when market prices fall substantially below the effective support price for eligible producers. The aggregate demand curve under the conditions specified is illustrated by the dashed line in Figure 1, section C. The slope of this curve depends on the amount of grain under support, and the extent to which eligible producers purchase feed from noneligible pro-

ducers and thus more nearly approximate conditions of a normal (non-price support) demand curve when the market price falls substantially below the support price.[7]

The quantity of current-crop grain under support is thus an increasing function of the supply in excess of the feeding demand, usual working stocks, exports, and food and industrial uses. If eligibility and storage are limited, this function approaches a maximum, at which point no additional current-crop grain can be put under loan. Thus, as shown in Figure 1, section D, with a given level (1) of price support, (2) of demand for livestock products, and (3) of quantity of feed grains, the market price of corn (x) is determined by the intersection of the inelastic supply curve (assumed given for a particular year) with the total demand curve (i.e., demand for feeding plus the "support-program demand" curve). The quantity fed is obtained by the intersection (y) of the feed demand curve and the established market price. At the point where no further grain is placed under support due to lack of eligibility (z), the feed demand curve behaves like the normal demand curve for feeding. The quantity of grain placed under support, naturally, is the difference between that utilized or stored commercially and the total supply. The market price of corn under a support program and the quantity of grain placed under support thus depend on the quantity of feed grains, the price support level, numbers of animals fed, rates of feeding, and prices of livestock products.

Statistical Estimation of the Normal Demand for Corn

Previous studies have indicated the principal factors that affect the price of corn in the November-May period, namely, the total supply of feed concentrates, prices of livestock and livestock products, and the number of animal units fed.[8] In the present study, a similar statistical analysis was made, including only those years for which the price support program was either not in effect or for which insignificant quantities of current-crop grain remained under support.[9] This equation provides

[7] Cash grain producers without livestock enterprises do not have this alternative, and may overplant acreage allotments to a lesser degree than do producers of both corn and livestock.

[8] Foote, *op. cit.*, pp. 5-12.

[9] The results, given in the following equation, are based on an analysis for 1921-36, excluding 1933, and 1946-51, excluding 1948 and 1949:

$$\log P_c = -0.34 - \underset{(.35)}{2.00} \log Q_1 + \underset{(.07)}{1.40} \log P_L + \underset{(.84)}{1.55} \log AU$$

$R^2 = 0.97$; $s = 0.047$. Numbers in parenthesis beneath the regression coefficients are their respective standard errors. The variables are as follows:

P_c = price per bushel received by farmers for corn, November-May, in cents.

Q_1 = total supply of feed concentrates, including total stocks of corn on October 1, and of oats and barley on July 1, production of the four feed grains, and imported grain, wheat, and byproduct feeds used for feed, in million tons (unweighted). For

an approximation of the demand for grain for feeding if we assume that the composite demand for exports, commercial storage, and food and industrial uses does not exert a differential effect over the period. Comparison of actual and estimated prices for years included in the analysis indicate a good fit, although deviations for a few years are fairly large, as must be expected in any statistical analysis.

This equation also was used for years in which support programs were in operation to predict the price of corn associated with three supply variables, namely Q_1, the total quantity variable used for nonsupport years; Q_2, which deducts stocks owned by CCC plus old-crop grain resealed as of May 31 for corn, and March 31 for oats, barley, and sorghum grains from the total quantity; and Q_3, which equals Q_2 minus the quantity of current-crop loans outstanding, as of the specified dates, and purchase agreement grain delivered to CCC or placed under the loan program.

If the demand for corn for feeding is adequately reflected in the price-predicting equation, the market price of corn in support years should be slightly lower than that estimated by using the quantity variable Q_3, as the aggregate demand for feeding is thought to be somewhat less elastic for support years resulting in a lower price than estimated from the price-predicting equation. This development assumes that stocks owned by CCC and old-crop loan resealed are isolated from the market so as to have no effect on current price. Before discussing these results, the statistical analysis of the quantity of current-crop grain placed under support is presented.

Statistical Estimation of Current-Crop Grain Under Support

Factors that influence the quantity of current-crop grain under support as of a specified date include several not easily quantified. Lack of eligibility, for example, is reflected in increased animal units and feeding, and the aggregate quantity moving under support is probably less than if all farmers were eligible for the loan. Although prices of livestock products and the number of animal units are to some extent determined simultaneously with the price of feed and the quantity of grain going under loan, for this formulation we assume they are given. This allows a least-squares estimation of the current-crop grain under loan. The "degree of eligibility" is assumed to be reflected in livestock producers' reactions, i.e., with

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1950 and 1951, stocks owned by CCC as of specified dates plus old-crop grain resealed are excluded.

P_L = index numbers of prices received by farmers for livestock and livestock products (1910-14 = 100), average for November to May.

AU = number of grain-consuming animal units fed on farms during the year beginning October, in millions.

changes in animal units; feeding rates are reflected to some extent in livestock prices. Under these conditions, the quantity of current-crop grain under support can be expressed as a function of the announced price support level, free supplies of feed concentrates, prices of livestock products, and animal numbers.[10]

The type of relationship assumed is indicated in Figure 1, sections C and D. With a given level of price support and general level of demand, the quantity of current-crop grain under loan varies directly with the quantity of concentrates, but with eligibility and storage restrictions, this quantity reaches a maximum (point z in diagram D). A logarithmic function was used in fitting the data because a multiplicative relationship is assumed to hold among the several independent variables. This empirical function does not give a maximum limit to the quantity of current-crop grain under support, nor did it seem reasonable to use a function that would allow for this as only nine years of data were available and certain important factors cannot be specified.

The function used is such that, with a given level of livestock prices and animal units, the quantity of current-crop grain under loan increases at an increasing rate as the quantity of feed concentrates increases. This implies that the quantity fed increases less, with a given decrease in price, than would be true for the same demand conditions with no support program (i.e., the feeding curve is more inelastic under a support program at prices below the support price). When quantities of feed concentrates are very large in relation to demand, the function implies that the demand curve for feeding actually turns back and becomes positively sloped. This of course, is an unrealistic situation; a method for obtaining approximate quantities of current-crop grain placed under support under these unusual conditions is illustrated for 1953 in Figure 1, section E.[11]

For 1953, the predicting equation indicated a quantity of 14.8 million tons of current-crop grain under support is compared with an actual

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[10] The results, given in the following equation, are based on an analysis for 1937-41, plus 1948, 1949, 1952, and 1953:

$$\underset{}{\text{Log } Q_s} = \underset{}{-13.3} + \underset{(1.3)}{6.5 \log P_s} + \underset{(5.4)}{17.8 \log Q_2} - \underset{(2.0)}{10.1 \log P_L} - \underset{(3.2)}{6.5 \log AU}$$

$R^2 = 0.95$; $s = 0.115$. Numbers in parenthesis beneath the regression coefficients are their respective standard errors. The variables are as follows:

Q_s = quantity of loans outstanding as of May 31 for corn and March 31 for oats, barley, and sorghum grains plus purchase agreement grain actually delivered to CCC or placed under loan.

P_s = National average price support per bushel for corn, in cents.

Q_2 = Total supply of feed concentrates (see footnote 9) minus stocks owned by CCC as of May 31 for corn and March 31 for oats, barley and sorghum grains plus old-crop loan stocks resealed.

P_L = (see footnote 9).

AU = (see footnote 9).

[11] This method is described in detail in a report in preparation for later publication.

quantity of 14.4 million tons. To obtain the data plotted in section E, various values of Q_2 were substituted in the equation, keeping the support level, prices of livestock products and animal units at their values for 1953. The "quantity-fed" curve is obtained by subtracting the estimated quantity under support from the respective Q_2 values. For this year, the derived quantity-fed curve starts turning down (point N) at about the point associated with the Q_2 value for 1953, and the estimated quantity under loan (point A). Theoretically, we would not expect the quantity-fed curve to ever turn down. Use of that Q_2 value associated with the maximum of the derived quantity-fed curve allows us to approximate the quantity of current-crop grain under support in years for which direct use of the equation gives unreasonable results.

By making use of this modification in a few years, estimated quantities were in line with actual quantities of current-crop grain under support for most years from 1933 through 1954, excluding the war years.

A Graphic Analysis for Individual Years

The standard error of estimate for the price-predicting equation for nonsupport years is such that there is a 65- to 70-percent chance that the predicted price will differ from the actual price by not more than 5 percent and a 95-percent chance that it will differ by not more than about 10 percent. Although all 19 observations fell within the range of two standard errors, the difference between the actual and predicted price for some years was larger than the magnitude of the price effect that presumably could be attributed to the operation of the support program. Thus, results of this type of analysis must be taken with some reservations.

The type of market price determination assumed in this development is that given in Figure 1, section D. As there is considerable uncertainty as to the effect of the support program in quantitative terms, years involving important price support operations were examined graphically. A demand curve was plotted for each year, based on the price-estimating equation, using the respective prices of livestock products and animal units for that year. Results for 1953, shown in Figure 1, section F, closely approximate the assumed model, with the market price slightly lower than that estimated from the price-predicting equation using the quantity variable Q_3. For the 12 years plotted, results agree fairly well with the assumptions of the analysis, although indicated prices for 1954 and 1955 were too low.[12]

Tentative Conclusions as to the Effect of Stocks Owned by CCC

One of the basic assumptions of this model, as noted, is that stocks owned by CCC plus old-crop grain resealed as of specified dates do not

[12] Diagrams for each year will be included in a later publication.

TABLE 1. CORN: DIFFERENCE BETWEEN ACTUAL AND ESTIMATED PRICE PER BUSHEL FOR YEARS GROUPED ACCORDING TO THE RELATIVE IMPORTANCE OF CURRENT-CROP QUANTITIES OF FEED GRAINS UNDER SUPPORT AND STOCKS OWNED BY CCC PLUS OLD-CROP GRAIN RESEALED, 1933–54

Group and year beginning	Quantity		Price		
	Placed under support[1]	Owned by CCC[2]	Actual[3]	Estimated[4]	Difference
	Million tons	*Million tons*	*Cents*	*Cents*	*Cents*
1. Stocks owned by CCC are *small* and quantities of current-crop grain under support are—					
(a). Small:					
1934	0.3	—	83	90	− 7
1935	.7	—	56	59	− 3
1936	—	—	106	101	5
1937	1.2	—	51	49	2
1946	.6	0.3	138	132	6
1947	.0	—	220	196	24
(b). Large:					
1933	5.6	—	45	40	5
1938	6.4	1.0	44	50	− 6
1948	13.5	.2	120	142	−22
2. Stocks owned by CCC are *large* and quantities of current-crop grain under support are—					
(a). Small:					
1940	2.9	11.5	58	61	− 3
1941	3.3	4.8	74	76	− 2
1950	3.1	15.9	155	176	−21
1951	1.0	10.7	167	175	− 8
(b). Large:					
1939	8.3	7.0	55	55	0
1949	12.1	12.4	118	134	−16
1952	10.8	7.0	147	147	0
1953	14.2	13.3	142	148	− 6
1954	11.2	20.5	138	122	16

[1] Quantity of loans outstanding (as of specified dates) plus purchase agreement grain delivered to CCC or placed under loan.
[2] Stocks owned by CCC plus old-crop grain resealed as of specified dates.
[3] Price received by farmers, average November to May.
[4] Estimated from equation in footnote 9, using the variable Q_2, which deducts total quantities of grain under support as of specified dates.

significantly depress the November-May price of corn received by farmers. A problem is the difficulty of separating out the effect (1) of quantities of current-crop loan stocks and (2) of stocks owned by CCC, as the two series move together for some years. The method adopted here formulates a model that appears conceptually correct, and then checks the unexplained errors in estimation to see if they are related to the quantity of stocks owned by CCC.

Table 1 groups together certain years depending on the relative im-

portance (1) of quantities of current-crop grain under support and (2) of stocks owned by CCC plus old-crop grain resealed, for all years in which support programs were in effect except during World War II.

Group 1-a includes years in which both current-crop stocks and stocks owned by CCC are small. These years were included in the statistical analysis of the price of corn. The price deviations in these years are assumed to be influenced only slightly, if at all, by the operation of the support program.

Group 1-b includes years in which quantities of current-crop grain under the program are fairly significant, but stocks owned by CCC are small. 1933 was an atypical year because the crop was considerably smaller than a year previous and there were no eligibility restrictions. The theoretical model assumes that the use of Q_3 gives a price that is above the market price, and this holds true for the other two years.

Group II-a includes years in which quantities of current-crop grain under the program are relatively small, and stocks owned by CCC are large. If CCC stocks do depress the market price, we would expect the price estimates to be significantly above the market price, after allowance for the effect of current-crop support quantities. The year 1950 tends to substantiate this assertion, but the effect is not as strong as an addition of an equal amount to free supplies. The years 1940, 1941 and 1951 tend to substantiate the assumption of the model that stocks owned by CCC do *not* depress the market price significantly.

Group II-b includes years in which quantities of current-crop grain under support and stocks owned by CCC both are large. Results for 1949 suggest a price-depressing effect of CCC stocks, although larger stocks in 1953 do not support the assertion that increased stocks depress prices to a greater extent.

In general, relationships for these years are not out of line with the assumed model. However, the evidence from an analysis of this nature must be considered less than conclusive. Demand for feed grains in recent years may be more inelastic than in earlier years due to feeding rates and changed relationships other than the operation of the support program. Inspection of available data does not seem to indicate a consistent trend over time of this nature, although actual prices for 1954 and 1955 are considerably higher than can be explained by this analysis.

Summary

A framework for analysis of the price support program for feed grains is given that illustrates the basic economic relationships that affect the utilization of grain between government storage and normal market outlets. The paper attempts to indicate the impact of certain factors that must be considered in any appraisal of alternative support programs. More

specifically, it presents major economic factors that determine (1) the market price under the support program, (2) the quantity of current-crop grain placed under support, and (3) by subtraction, the quantity of grain fed or utilized for commercial stocks and exports. Quantities used in the analysis relate either to the four feed grains—corn, oats, barley, and sorghum grains—or to total feed concentrates; the price of corn, however, is used to represent the price of all feed grains. Statistical analyses are discussed (1) for the demand for feed grains in years for which the price support program is believed to have had little effect on market prices and (2) for the quantity of grain placed under support. The latter works well as an estimating medium except in years when the total supply is unusually large in relation to demand. A separate method for estimating quantity placed under loan for such years is described. Graphs were used in the study to illustrate market prices expected under given conditions; actual prices agree fairly closely with those expected from the structural analysis. Estimated prices are compared with actual prices to test the assumption that quantities withheld from the market (stocks owned by CCC plus old-crop grain resealed) do not affect the November-May average price of corn received by farmers. Although no firm conclusion is reached, the results suggest that these stocks are usually isolated in such a way as not to affect the market price.

NEW IDEAS AND METHODS FOR PRICE RESEARCH

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RESEARCH has some resemblance to gold mining. Each seeks a rich reward from the search; and in each, the deposit being mined at any one point, whether of gold or of knowledge, tends sooner or later to approach exhaustion. In research, new ideas, when they are fruitful, are means by which new mines of knowledge are opened up.

Good new methods in research are like good new methods of mining or of ore extraction: they ease the labor; or they yield what was previously unattainable. Sometimes new ideas must perforce be accompanied by new methods, as a new mine, yielding a different sort of ore, may require a new method for treatment of the ore.

Price analysis is an area of research that has now been worked for many years. The present mines may not yet be close to exhaustion, but we do well to look sympathetically at new ideas and new methods for price research, to see what promise they hold. I propose to speak of a few ideas briefly, and then to consider in more detail one or two ideas that I myself have recently been seeking to apply.

1. Equation Systems

The ideas that guide research are of two sorts, substantive and methodological. In each category, they range from broad to highly particular.

The most prominent new idea in price research during recent years has been a methodological one expressed by Girshick and Haavelmo as follows: ". . . *it is impossible to derive statistically the demand functions from market data without specification of the supply functions involved.* More generally, if we wish to estimate any particular economic relationship on the basis of market data we are forced to consider, simultaneously, the whole system of economic relations that together represent the mechanism that produces the data we observe in the market."[1]

This startling and far-reaching claim cast doubt on the reliability of all past work in price analysis; it called for the development and subsequent use of elaborate new statistical methods; and it implied the need for a vast program of statistical computation, to replace previous work with results based on the new methods. The immediate effects were to put a damper on price research; and to promote the development of new methods, and the training of workers in their use. It thus, for a time,

[1] "Statistical Analysis of the Demand of Food: Examples of Simultaneous Estimation of Structural Equations," *ECONOMETRICA*, April 1947, p. 83. Italics are those of the original authors.

diverted research from essentially economic problems to mathematical and statistical problems.

Results thus far suggest that this new idea may prove to have been both unfruitful and ill-founded. A recent study of wheat prices, which gives results from use of the new equation-system method, in comparison with those from use of the older, single-equation, method remarks that, "The coefficients obtained from the two methods are surprisingly similar."[2] Perhaps we should not be surprised by the discovery of such similarities. So far as I know, no valid proof has ever been given that a substantial difference should be expected between results of the two methods.

The contention that coefficients should be determined simultaneously for all of the equations in a system of relations, rather than separately for single equations, rests on supposed proof that the coefficients obtained by fitting single equations are subject to severe bias of a particular sort. Several papers have been published that attempt more or less popular explanations of this proposition, but I know of only two mathematical proofs that have been attempted. Both of these purported proofs are fallacious, as I have shown elsewhere.[3]

2. *Economic Models*

When one looks for new substantive ideas, rather than new methodological ones, that may prove fruitful in price analysis, thought turns naturally to the economic models used in such analyses. Can they be improved? A considerable number of improvements have been made in models used for price analysis during the last thirty years, and I have no doubt that there are more improvements still awaiting discovery.

There is need, however, for some change in practice if the improvement of economic models is to go forward confidently and systematically. Published studies should give more attention than they often have to the evidence supporting use of one model rather than another. Let me illustrate from two studies involving wheat prices.

Some years ago I reported results of an analysis involving the relation between wheat prices and wheat exports from the United States.[4] Those

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[2] Kenneth W. Meinken, "The Demand and Price Structure of Wheat," *U. S. Dept. Agr. Tech. Bul. No. 1136*, p. 41.

[3] In *Potentials of Econometrics*, in press. Adequate criticisms of the supposed proofs cannot be given in a sentence, but expressed thus briefly, my criticisms are that Girshick and Haavelmo (*op. cit.*) produced evidence of bias by using the "wrong" regression coefficient—by using the other regression coefficient they would have shown absence of bias; Jean Bronfenbrenner ("Sources and Size of Least-Squares Bias in a Two-Equation Model," *Studies in Econometric Method* [New York, 1953], pp. 221-235), showed bias by testing a simple regression coefficient in a case where use of a partial regression coefficient was clearly indicated and possible.

[4] "The Changing World Wheat Situation," *Wheat Studies of the Food Research Institute*, September 1930, Vol. VI pp. 438-39.

results, as I view them now, were very inadequately published. What appeared in the printed record was simply a conclusion regarding the functional relation involved, supplemented by evidence that the pertinent statistical data were consistent with the stated conclusion. This is inadequate evidence to support the conclusion, because it fails to show that the functional relation stated to exist explained the facts any better than, or as well as, some alternative hypothesis regarding the functional relations. The conclusion did indeed rest on a testing of several alternative hypotheses, but the published results must be judged by the evidence that was published, and that was insufficient.

This defect in my own publication was impressed on me lately by reading Meinken's recent study, *The Demand and Price Structure for Wheat.*[5] Meinken used a quite different formulation of the relationship between prices and exports than I had arrived at and, like me, gave no evidence that his choice of model was superior to possible alternatives.

Many other examples of this sort might be given. Investigators have tended to try various economic models as bases for statistical analysis, and to present the results as they might the results of using a cake recipe. It may be true that the excellence of a cake recipe is to be judged solely by the taste of the cake, and it was reasonable in the early days of price analysis that the economic models used should have been judged acceptable if they produced a good coefficient of correlation; but if systematic progress is to be made in the improvement of economic models, there must be critical study and publication of pertinent evidence by which one model may be judged better than another. An economic model used in statistical analysis is an hypothesis, and no hypothesis is adequately tested merely by showing that it accords reasonably well with observed facts; proper testing of hypotheses requires testing against alternative hypotheses.

3. *Price-movement Analysis*

When we speak of improving economic models, we tend to think of improvement in models of a familiar sort. Seeking such improvement of conventional price-analysis models is seeking new mines of information in an area that has already been fairly well prospected. Perhaps there are richer mines to be found in some area that has thus far been little explored.

Such a new and promising area exists, I believe, in a field that may be called *price-movement analysis.* Most price analysis has not dealt with price movements, as such, but has concerned itself with explaining price levels—with explaining averages of prices over stated periods. It has taken

[5] Meinken, *op. cit.*

its form from the mold of an economic theory that is basically a theory of static equilibrium. Price changes have been treated, in the main, as though they reflected only changes from one equilibrium condition to another, or else were erratic fluctuations whose explanation, if it were possible, would contribute little to economic knowledge.

Economic theorists have long been troubled by the thought that a theory of static equilibrium may fall seriously short of explaining the phenomena of a dynamic world. Perhaps one strong reason for the current wave of interest among economists in economic growth and development is a hope that out of such study of economic change may come a body of theory that will be truly a dynamic theory. Dynamic phenomena are the phenomena of change, and one may reasonably suppose that a valid dynamic theory can emerge only out of the study of economic change. One class of economic changes that surely deserve attention are the movements of prices.

Among existing studies that I should class as price-movement analyses are many that are highly respected by practical people who seek help in the prediction of price movements. One early type of such analysis is represented by studies of cycles in livestock prices.[6] Another type first came to my attention in a short published note in which P. K. Whelpton examined differences in the course of cotton prices in the months following harvest, according to whether the crop had been large or small.[7] When I later experimented with this sort of analysis, I called it analysis of "conditioned seasonal" movements.[8] Still other sorts of price-movement analyses have been tried, and have yielded information that businessmen and speculators apply with profit. Price-movement analysis clearly deals with significant facts of price behavior.

Price-movement analysis has sometimes been scornfully called "research without theory." It is that, perforce, because existing price theory is basically a theory of static equilibrium, and there is no well-developed dynamic theory of price movement. Price-movement analysis probes an area of which economists know little and understand less. But is it unwise and unprofitable for research to probe the unknown, where there is no firm theory to guide the research? Or is it those areas where facts are little known and poorly understood that should especially challenge research?

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[6] For example, G. F. Warren, "Prices of Farm Products in the United States," *U. S. Dept. Agr. Bulletin* 999, pp. 7-10, 1921.

[7] P. K. Whelpton, "Seasonal Fluctuations in the Price of Cotton, *Journal of Farm Economics*, Vol. VII, No. 4, October 1925, pp. 445-450.

[8] "Price Relations between May and New-Crop Wheat Futures at Chicago since 1885," *Wheat Studies of the Food Research Institute*, February 1934, Vol. X, p. 209, and elsewhere.

4. Classification of Price Movements

Research in areas of which little is known require first a groping for pertinent facts. While it explores new territory, without roads and without maps, such research needs to be guided by some plan and oriented by some compass, lest the intended exploration become aimless wandering. One plan that has often been followed in price-movement analysis is to seek regularities of price behavior that have practical predictive value. This has been a good plan, in the existing state of ignorance about price behavior. It has helped to build a foundation of factual scientific knowledge while it contributed also to more immediately practical ends. Yet the facts so gained have not led easily or quickly to conclusions of general economic interest; they have stood chiefly as a collection of disconnected facts, interesting only to specialists.

In an effort to make fact gathering contribute more directly to questions of recognized economic importance, I have tried in recent years a plan that hinges on a classification of price movements.[9] The classification is particularly pertinent to relatively short-time price movements, comprised within a year or less, and such movements are most conspicuous in the class of prices that I call "speculative." By a *speculative price*, I mean one that depends strongly on expectations—prices like those of wheat, corn, cotton, hay, or apples, in markets where prices are relatively free to move as expectations change. In this work I have sought to measure characteristics of price change that reflect the quality of market performance—precision of adjustment to changing knowledge of economic conditions, and the kinds and extent of price maladjustment.

Imagine every individual price movement to be of simple character, so that it can be placed in some one specific category. Then all relatively short-time movements of a speculative price may be classed, conceptually, (1) as movements related to pertinent new market information; or (2) as movements unrelated to such information. The first of these categories may profitably be divided into three subcategories, according to whether the price movement was: (a) exactly appropriate, in size and direction, to the new information that induced it; (b) larger than the new information warranted; or (c) smaller than the new information warranted. The second of the two broad categories may be divided into two subcategories, according to whether the movement was: (a) unrelated to any pertinent economic information; or (b) corrective, tending to eliminate an existing price maladjustment. The result is a five-way classification of price movements summarized below.[10]

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[9] The particular form given to the classification here is new, but it is a development of ideas that I presented first in "The Investigation of Economic Expectations," *American Economic Review, Papers and Proceedings*, XXXIX, 150-66 (May, 1949).

[10] The characterizations of classes cover all possibilities unambiguously, I believe,

Kinds of Price Movement

No.	Name		Characteristic
1	Exact	} --- {	Just appropriate, too large, or too small *in relation to pertinent new economic information*
2	Excessive		
3	Inadequate		
4	Erratic	----	Unrelated to pertinent economic information
5	Corrective	----	Correcting previous maladjustment

5. *Measured Behavior Characteristics*

The foregoing classification has, I think, quite obvious merits as a basis for abstract discussion of price movements. Quite as obviously, one cannot expect to take individual price movements—say the change in wheat prices between yesterday and today—and always, or often, determine with certainty whether or not that particular price movement was exact, excessive, inadequate, erratic, or corrective. But the usefulness of the classification is not restricted to abstract discussion; I have been able, by statistical measurement, to produce evidence on the relative extents to which actual price movements fall into certain of these categories.

The pertinent measurements that I have made rely on necessary statistical relations between corrective price movements and the prior movements whose effects they correct. Corrective movements following movements that were either *excessive* or *erratic* must have a direction opposite to that of the movements to which they supply correction. Correction of *inadequate* movements, on the other hand, requires corrective movement in the same direction as the movements to which they supply correction. By relying on these facts, one may look for evidence on the nature of price movements through study of the serial correlations among them.

Pursuit of this line of reasoning has encountered some fascinating problems of method. Although study of serial correlations is called for, customary methods of measuring serial correlation fail utterly on the data that I have used. Their failure is partly due to the small magnitude of the correlations to be detected; but they fail more particularly, I think, because of their implicit assumption of a uniform time interval among related movements. Corrective price movements may in fact occur in widely varying time relation to the movements to which they supply correction. To get statistically significant results, I have had to use methods especially designed to reveal the presence of serial correlations with highly variable time relations.

My statistical measurements thus far have dealt chiefly with futures prices of wheat, corn, and rye. The comparable results for each of these

except for the contingency of a price movement apparently induced by new market information, but occurring in the wrong direction. Such a movement must be classed as erratic (Class 4), because its correction requires opposite movement.

commodities have been quite similar, and the main evidence, which is all that can be discussed here, was to me quite surprising. In prices of all of these commodities the dominant characteristic found was that of inadequacy of initial response to new economic information, followed by corrective movement in the same direction as the initial movement. One must assume that in all of these prices there occurred excessive price movements and erratic movements, followed by *opposite* corrective movements. Certainly the occurrence of erratic movements, not warranted by contemporary new information, must have been fairly frequent. Yet in the measurements of average tendency, inverse correlations between excessive or erratic movements and their subsequent corrective movements, were submerged, as a rule, by positive correlation arising from a dominant tendency toward inadequacy of initial response to new economic information.[11]

The statistical measures also supplied clues to the kind and amount of average lag between initial price response to new market information and the subsequent correctvie movement in the same direction. To test my deductions from these clues, I constructed an artificial, or synthetic, price series embodying the main characteristics of which evidence was found in the actual prices. Describing the construction of this synthetic price series and exhibiting its remarkable resemblance to an actual speculative price series is the most effective means, I think, for briefly indicating the principal characteristics found in the behavior of actual speculative prices.

For the synthetic series, I assumed that price movements consisted wholly of two sorts: (1) initial movements in response to new and unpredictable[12] economic information, and (2) further, delayed, response to this same information. Consequently, the computed synthetic series contained no excessive movements, no erratic movements, and no corrective movements other than those that corrected initially inadequate movements. The initial responses to new information, as built into the synthetic series, were just two-thirds[13] of the response warranted by the information. The remaining delayed response to each piece of new information was spread evenly over ten days following the initial response.[14]

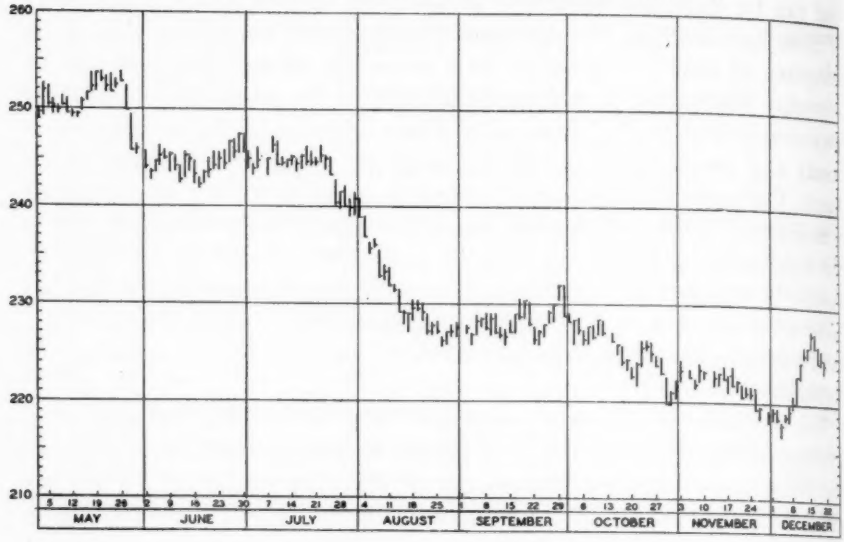
[11] The study, on which a full report will be published shortly, has covered all quoted prices of certain Chicago wheat futures for 67 years, and all quoted prices of certain Chicago corn and rye futures for 10 and 5 years respectively. Part of the results appear in a doctoral dissertation by Claude S. Brinegar, Stanford University, 1954.

[12] Information is strictly new only to the extent that it is unpredictable in advance.

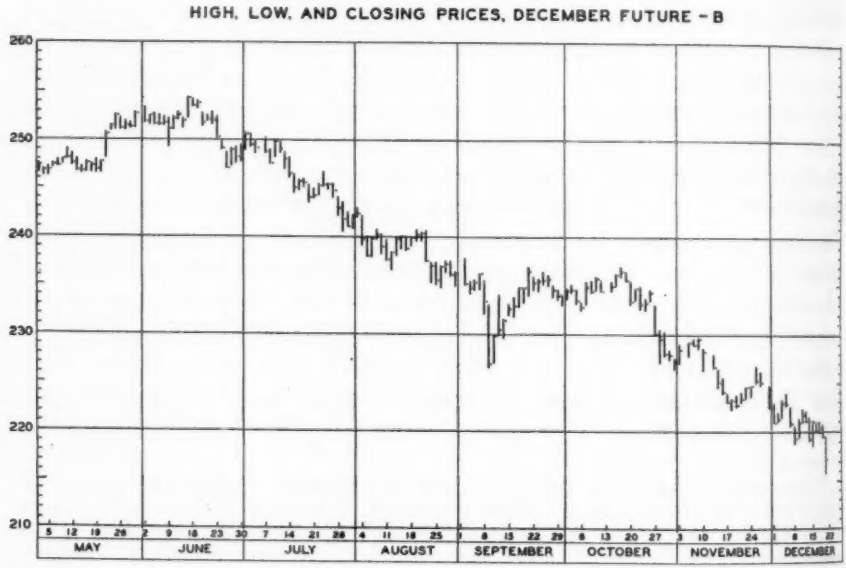
[13] Three-fourths would apparently have been a more realistic fraction to use, but one purpose of the synthetic series could be served best by somewhat exaggerating a characteristic whose effect was being tested.

[14] The results of using this pattern for spreading the delayed response would be indistinguishable, I think, from those of using almost any pattern involving *variation* in the timing of delayed response, with equal probability that it occur on any one of the ten days after the initial response.

HIGH, LOW, AND CLOSING PRICES, DECEMBER FUTURE - A



HIGH, LOW, AND CLOSING PRICES, DECEMBER FUTURE - B



One would like, in constructing such a series, to base it on actual economic information. Then the synthetic series would represent the course that the price of wheat, for example, would have taken, during a particular series of days, if the market had responded in the manner assumed. But we do not know all the items of economic information that

affected an actual market price during any given series of days; and still less do we know just what price response was warranted by each known piece of information. Failing such knowledge regarding the economic information that emerged during a specific period, the synthetic series must be constructed from hypothetical information possessing the essential characteristics of actual economic information. The main characteristic to be satisfied by the hypothetical information is that it be unpredictable. The price effects assumed warranted by the hypothetical new information must therefore be statistically random in character. Such price effects may conveniently be simulated by drawing numbers from a random sampling table. My synthetic series was based on numbers drawn from Tippett's table,[15] taking fifteen such numbers (new bits of "economic information") per day.

The results of constructing a synthetic price series in this manner are shown in one of two accompanying charts. The other similar chart shows the course of an actual price series during a recent eight-month period. By comparing the two, a reader may judge how well the synthetic series has reproduced the behavior characteristics of actual prices. Although the imitation is defective, it takes a skilled and close student of prices to distinguish reliably which is the real and which the artificial price series.

6. *Price "Formations"*

The tools of analysis that I have used in attaining the results briefly summarized above, are refined tools by comparison with techniques previously available, but they have limitations. They measure average characteristics, with only limited opportunity for making the measurements separately for different conditions. A good deal of significant diversity of behavior may be concealed within the averages. In particular, I think that price movements in response to what traders and market commentators call "technical" influences may be imperfectly reflected in the measures that I have used. "Technical" influences presumably are a major source of what are designated in our classification as *erratic* price movements; and it is particularly desirable to measure adequately the relative importance of erratic movements in speculative prices.

Construction of the synthetic price series exhibited above has suggested a means for probing more precisely the nature and extent of erratic price movements. The synthetic series closely resembles actual prices in its behavior, but includes no erratic movements—only movements of other sorts. By extending this synthetic series—or better, by building a still more realistic one, which I have since learned how to do—one could provide a

[15] L. H. C. Tippett, *Tracts for Computers, No. XV, Random Sampling Numbers*, Cambridge University Press, 1927.

scientific "control" by which to test accurately some of the ideas that traders have developed regarding "technical" price movements.

There are traders who have devoted a vast amount of study to the "technical" characteristics that they believe they observe in price behavior. Those among them who are communicative will discourse at length about head-and-shoulders formations, resistance and support levels, triangles, turn-around signals, gaps, channels, and other evidences of "technical" behavior of prices. Yet most of these supposed evidences of "technical" behavior can be found in the synthetic series, and we know that in it they do not reflect such behavior, since none has been built into it. The synthetic series, therefore, provides evidence to support the opinions of those students of prices who scoff at the ideas of the "chart traders," and regard their "technical formations" as similar to the faces and figures that one may see in the changing outlines of a cloud in the summer sky.

Although I may seem to have implied that these "technical formations" in actual prices are illusory, they have not been proved so. The present synthetic series is too short to permit any confident conclusions, but it is noteworthy that, whereas turn-around signals, for example, appear with about equal frequency in both the actual and the synthetic series, they prove to be false signals about half the time in the synthetic series, as should be expected, but valid signals more often than not in the real price series. I have no doubt that some of the recognized "technical formations" do reflect real technical characteristics of price behavior. The economically significant question to be answered by further research is this: Have real "technical" movements constituted a large element in the fluctuations of actual speculative prices? Or have such prices fluctuated, as my tests thus far seem to indicate, mainly in appropriate response to changing economic information that ought to cause changes in price in a free and competitive market?[16] Have the markets served well, keeping prices usually close to the level warranted by existing economic information, and recording price changes chiefly in response to changes in pertinent economic information? Or have the speculative markets generated a large amount of economically unwarranted and undesirable fluctuation in prices? The road seems open to research that can produce fairly definite answers to these questions.

[16] Professor Shepherd, in his thoughtful and sympathetic commentary on this paper, noted apparent inconsistency between this statement and the earlier observation that immediate price response to pertinent new economic information tended to be "inadequate." Yielding too far to pressure for brevity, I failed to indicate the introduction here of an element of appraisal, which allows me to regard price responses to new information as "appropriate," or at least not seriously inappropriate, even though the full and proper response tends to be arrived at somewhat cautiously, through an initial "inadequate" response that is followed soon by further movement in the same direction, correcting the previous inadequacy.

DISCUSSION: RESEARCH METHODS IN PRICE ANALYSIS

GEOFFREY SHEPHERD
Iowa State College

Gordon King's paper is a competent piece of work. It has a lot of good solid meat in it, and includes useful charts to illustrate the concepts that King develops in his analysis.

King bases his conclusions primarily on single-equation multiple regression analyses using logarithmic functions. More detail concerning his methods and conclusions is given in a longer paper to be published shortly by the AMS, USDA.

Part II of King's Table I includes 10 years when CCC stock were large. It indicates that the CCC stocks appeared to depress prices (that is, the stocks did not have the same effect as if they had been completely removed from the market) in two of the 10 years, to the extent of 16 cents in 1949 and 21 cents in 1950. The stocks appeared to depress prices to a less extent in two other years (8 cents in 1951 and 6 cents in 1952). They depressed prices only by insignificant amounts in two other years (1940 and 1941) and did not depress prices at all in two other years (1939 and 1952). That is, in half of the 8 years, the CCC stocks appeared to "hang over the market" to some extent; in the other half of the 8 years, they did not.

The results for the last two of the 10 years (1954 and 1955) however, are anomalous; the record large CCC stocks in those years appear to have *raised* corn prices substantially.

This is puzzling. I attempted to determine the reasons for this behavior by taking the residuals from King's table and plotting them against the CCC stocks, to see if a graphic picture of the nature of the relationship between the two series would throw any light on the matter. I did the same thing for another study that Dick Foote published in 1953 (*USDA Tech. Bul. 1070*). This study was kindly brought up to date by King and Foote.

Figure 1 shows the residuals from Foote's study. They have a fairly high positive correlation with the size of the CCC stocks the following October 1. This indicates that the CCC stocks are regarded as "held off the market." The elasticity of the regression line furthermore is about −0.6, which is about the same as the elasticity of the demand for corn for the country as a whole found in earlier price studies. One could construe this as meaning that the withholding of the CCC stocks had about the same effect as if the stocks had been completely removed from the market, or never produced in the first place.

Figure 2, based on the residuals from King's study, however, shows less clear-cut results. One would expect to find a different regression line

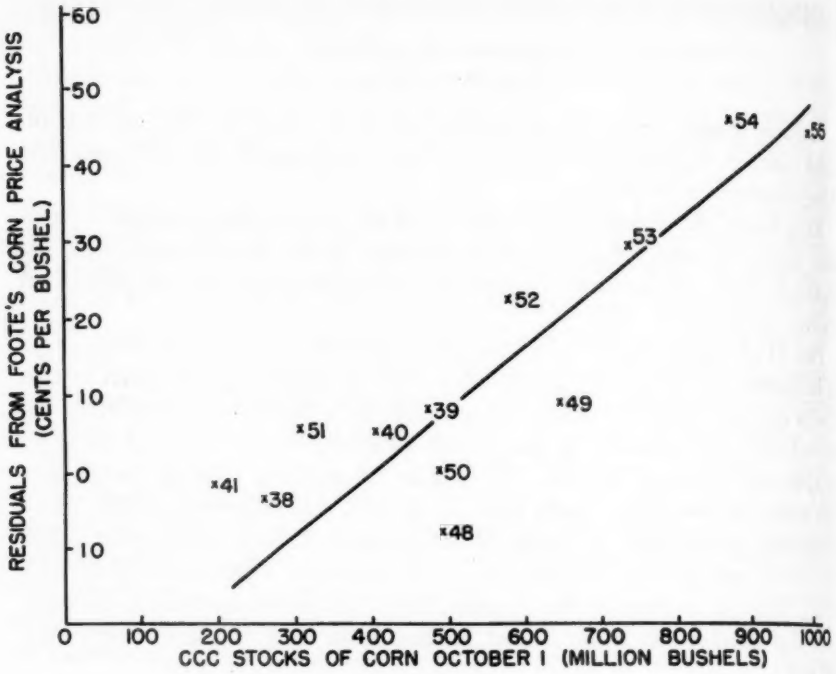


FIGURE 1

from the line based on the residuals from Foote study, because the two studies handle the CCC stocks differently. The CCC stocks are included in the corn supply data in Foote's study, but excluded in King's study. The horizontal zero line in Figure 2 is analogous to the positively sloping regression line in Figure 1. One therefore would expect to find the dots in Figure 2 scattered along this zero line; or, if one assumes that the CCC storage program makes the demand for feed and commercial storage less elastic, he would expect the dots to lie along a line with a slight positive slope. But actually the scatter of the dots in Figure 2 is fairly wide, and the dots for the last two years, 1954 and 1955, lie away off (16 and 22 cents) in the wrong direction, *below* the zero line.

King concludes that his study suggests that CCC stocks have little effect on market prices. He is well aware of the limitations of his data, and points out that the results of his analysis must be considered less than conclusive. Further research may permit further progress. At the least, Father Time will help by steadily providing longer and longer series of data.

Comments on Holbrook Working's Paper

It is said that most physicists make their major contributions before they are 30 years old, and merely coast along thereafter under the in-

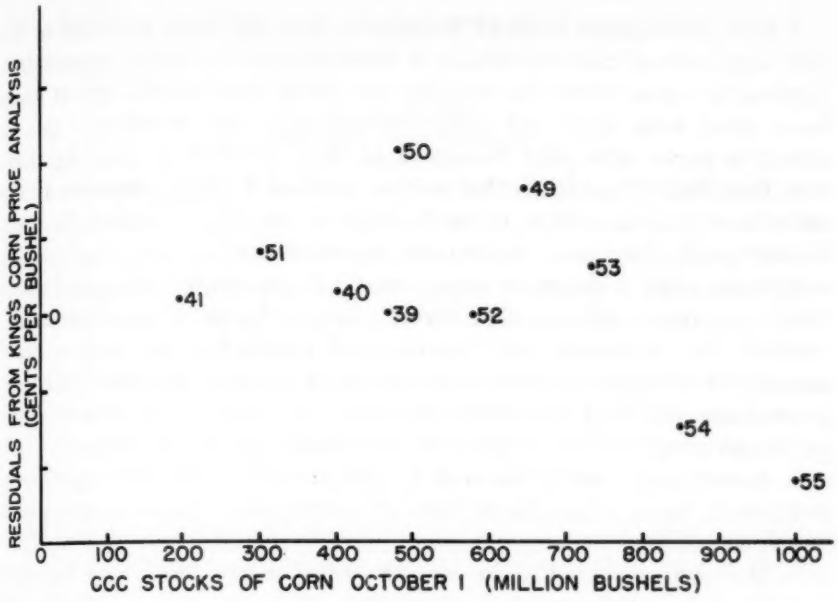


FIGURE 2

fluence of Newton's first law of motion. I observe that this is not generally true of economists. Holbrook Working's paper is further evidence that economists are more like presidents, who at least currently are presumed by some people to improve with age.

Holbrook has always been an explorer. Some explorers settle down after they have opened up a new piece of territory, and live thereafter in log houses protected from the arrows and tomahawks of those prowling Indians, their colleagues. But not Holbrook; he is still out beyond the bounds of civilization (any implied reference to California here is purely coincidental)

> "Or like stout Cortez, when with eagle eyes
> He stared at the Pacific, and all his men
> Looked at each other with a wild surmise
> Silent, upon a peak in Darien."

Only Holbrook has never been stout like Cortez, and he doesn't stay silent; he stared at the Pacific, and now he tells us what he saw. His paper makes three main points:

1. He questions that the simultaneous-equations technique can be expected to yield any better results than the single-equation technique. He believes that this new piece of territory is not worth the labor it takes to cultivate it.

I have been more inclined to believe that the logic involved in the two approaches indicates that the simultaneous-equations approach is superior in cases where the variables are jointly determined. We at Ames have spent some time and money investigating this question. I am inclined to agree with John Nordin *et al;* they conclude in their Ag. Exp. *Sta. Res. Bul. 410* at Ames that neither method is clearly superior to the other as a general matter. Even the logic of the case is not a fully satisfactory guide, for it may be no more logical to use say four simultaneous equations when a dozen or more equations are needed, than to have a single equation with say four terms when a dozen or more *terms* are needed. The conclusion that Nordin *et al,* reached is that with a given amount of money in a project, one can either spend it on more equations, or on more variables in a single equation, according to the nature of the particular project. The answer will differ from project to project.

2. Investigators would do well to test several alternative hypotheses, not merely the one hypothesis they set out to test. This view seems eminently sensible to me.

3. Holbrook reports that he has developed a new technique for what he calls price-movement analysis. He is quite undeterred by the lack of existing theory to apply in this new field. He finds statistical evidence that the initial response of prices to new economic information generally is too small. Prices do not overshoot the mark; they fall short of it. Only after some unspecified time lag do they hit the mark. Holbrook concludes that this type of analysis can be used to test whether or not markets respond appropriately to changing economic information.

My only other comment is that Holbrook's report of his new discovery sounds most intriguing. We must reserve judgment on how wild his surmise is until he has had time to catch his breath and publish more concrete information about it. We need to know more about how he reached his conclusions. And we need to know more about the conclusions themselves. How much too little were the initial responses of prices, and what was the dispersion about the average? How much of a lag was there before the prices hit the mark, and what was the dispersion there too? How did he know when the prices had hit the mark? I have full confidence that Holbrook will provide us with answers to these and other questions based on meticulous scholarly work, for the Working brothers are well-known for their solid craftmanship.

DISCUSSION: RESEARCH METHODS IN PRICE ANALYSIS

L. L. BOGER
Michigan State University

We have heard three papers, each of which makes a contribution to the sum of knowledge on research methods in price analysis. Even though the papers are on quite different problems there are similarities in lines of arguments that were unknown not many years ago. This exemplifies progress. I should like to comment briefly on each of the papers presented –in the reverse order of their presentation.

A literal interpretation of Working's statements on systems of equations leaves one with a feeling that many price analysts may have been wasting their time attempting to apply the methods that were developed beginning with 1943. This was a surprise, especially because it comes from one who has made so many substantive contributions himself. Most of us likely will not be inclined to agree with a literal interpretation of his statements but are more likely to feel that the contributions originating with the Cowles Commission are landmarks in the evolution of ideas that are *both* "substantive" and "methodological"–substantive in that the need for model building was stressed, methodological in that new statistical and computational procedures were needed and developed. Working, in his paper, admits to the need for both kinds of ideas as he unfolds his own on price movement research.

True, the new ideas of the Cowles Commission require more complicated computational procedures. This is part of the price paid for precision. An average is one of the simplest statistics representative of a mass of data. By contrast, the computation of the parameters in a single regression equation is complicated. The addition of variables or the addition of equations further complicates the computational procedures. No one would be interested in complicating a model so much that the uses for the more precise results would not offset the additional costs for obtaining them. But today, with the advancements in computer facilities, neither the time nor the dollars looms as a serious deterrent to the solution of even the larger models. The shortage of good data is a far more serious limitation to the attainment of good results than is either the complexity of the computational procedures or the lack of theory. This is not to say that we have enough good theory to solve all the problems facing the price analyst. And we should not forget that a good knowledge of mathematics in the tool kit of a capable person can be used to develop economic theory. Mathematics is a complementary rather than a supplementary discipline.

The observation that least-squares estimates have been close to those

yielded by simultaneous equations should not be accepted as the sole proof that one method is better than the other. There have been numeorus studies reported where the least-squares bias has been small or negligible. There are others where the bias has not been small. I have completed, but not yet published, one such illustration. The potential sources of bias from least-squares estimates are known and the method should not be applied in all cases any more than we use the range divided by 3.5 as the formula to compute an unbiased measure of the standard deviation.

Working's price movement analysis and the methods employed are intriguing. More attention needs to be devoted to the analysis of short-term price movements. Annual models have been pretty well worked over while time periods longer and shorter than one year have been slighted. Moreover, attempts to estimate the parameters of static models have been more numerous than those for dynamic models. But again, in any critical appraisal of static vs. dynamic models, one should not overlook the material between the covers of the now famous Cowles Commission Monograph 14. To be even more specific, there have been several rather successful attempts to develop generating models using systems of difference equations. Foote developed one for the feed-livestock economy and Suits has similarly analyzed the onion market.[1] Generating models are not new whether they are generated entirely from within or in part from exogenous forces.

Working's exposition certainly leaves one wishing that enough detail could have been presented so that it would be possible to duplicate his results. I, for one, do not know how the parameters for determining the amount of adjustment expected with a new bit of information were obtained, or if price movements are merely classified on the basis of what happened. In the grain trade there are institutional limitations on the amount that prices can change in the short run. Just how these would affect his analysis is not explained.

My final comment deals with technical formations in prices. These kinds of movements obviously are *caused* by something, just as the seasonal peak of egg prices in October year after year is caused by certain explainable forces. These price formations bear further looking into before accepting the assumption that they are merely technical phenomena.

King's paper represents a refreshing piece of analysis where the problems of an abnormal period are faced squarely rather than "omitted" away. The assumptions of his model clearly justify the use of least-squares estimation. Adequate theory is used to justify the model and the results

[1] Foote's study is reported in *Statistical Analyses Relating to the Feed-Livestock Economy*, Tech. Bull. No. 1070, U.S.D.A., June 1953, and Suits' analysis appears in "The Dynamics of the Onion Market," *Journal of Farm Economics*, XXXVII, No. 2, May, 1956.

seem plausible. Some additional refinements are possible. Certainly a case could be made for the argument that the number of animal units is endogenous to the price of corn. Also, we know that the price of corn does not always reflect the movement of the prices of all feed concentrates because of the changing composition of the aggregate. The effects of exports and imports could be more adequately treated.

Perhaps the most interesting observation stems from the attempt of my colleague, W. A. Cromarty, to compare a model of his own with that of King's. King's model, which explains the quantity of loans outstanding plus purchase agreement grain delivered to CCC or placed under loan (Q_s), turns out to be essentially a reduced form involving Foote's model, which explains the price of corn (feed concentrates), and a separate function which states that Q_s is a function of the ratio between the support price and the free market price for corn. This can be demonstrated as follows:

(1) $\log P_c = -0.34 - 2.00 \log Q_1 + 1.40 \log P_c + 1.55 \log AU$
(2) $\log Q_s = B (\log P_s - \log P_c)$

Equation (2) can be written as $\log Q_s = B \log P_s - B \log P_c$. Substituting (1) into the rewritten version of (2) we get:

(3) $\log Q_s = B \log P_s - B (- 0.34 - 2.00 \log Q_1 + 1.40 \log P_c + 1.55 \log AU)$.

Taking $B = 6.5$ (from King's equation in footnote 10) and noting that $Q_1 = Q_s + Q_2$, equation (3) can be written as:

(4) $\log Q_s = 6.5 \log P_s + 13.0 \log (Q_s + Q_2) - 9.1 P_c - 10.1 AU - 2.21$

From the above, it is apparent that King's equation, which explains Q_s, involves Q_2 (free stocks) rather than Q_1 (total stocks) in the reduced-form version shown above. Allowance for this, and using King's computed parameter for P_s yields results that are strikingly similar even though totally different observations were used for the estimations. With this kind of accidental hindsight, we conclude that King's analysis builds upon Foote's original work to the extent that when Q_s is not zero it is a function of the ratio between support and free market prices. To put it another way, if Foote had included Q_s as an independent variable in his analysis and added the data for the support years, the parameters for the variables included would not have been greatly different.

Harrington and Gislason are to be commended for their attempt to identify the importance of different factors on individual and aggregate fruit sales. Several studies have been made in an attempt to compute various demand elasticities. A far fewer number of researchers have successfully measured the effects of various quality factors on sales. The reasons for this become clear as one either ponders the problems of

measurement or carefully scrutinizes results presented in this and other studies. Take the problem of measuring quality as but one example. Most designations of quality include such things as color, ripeness, defects, size and other external factors in addition to the internal factors of texture, flavor, color of flesh, etc. Very few of these designations are independent, and not all are subject to cardinal measurement. But aside from these kinds of problems and those of sampling, there are real problems of statistical analysis.

One gets an uneasy feeling at several points in the Harrington-Gislason paper, and I know that they, as authors, no doubt have considered many of the possible alternative formulations. For example, their three objectives do not explicitly state a market reference point. Are they trying to measure demand and quality preferences for Denver consumers, all consumers, Denver consumers in retail food stores, or some other stratum? Apparently, a large portion of consumers' fruit purchases at certain times of the season is made outside of retail food stores. The results presented must be interpreted in this context. The problem of how to measure sales, or more precisely, quantity sold, is knotty and not dissociated from the objectives. It does not appear consistent to compute a ratio whose denominator is a price-weighted aggregative quantity ratio, for comparison with absolute values or simple relatives. At best, the interpretation of the regression for elasticity coefficients based upon these data becomes awkward. Perhaps absolute quantity data would yield more valid results, especially if some of the components of the index were in turn treated as independent variables.[2]

The paper is somewhat short on the justification of methods and the interpretation of the statistical results obtained. Perhaps a few questions will serve to illustrate the point:

(a) Of what real significance are the correlation coefficients for each of the products tested between the numerator and the denominator of the ratio yielding the dependent variable?

(b) Is there a linear relationship between color and sales, thereby allowing the normal color category to be eliminated from the regression analysis?

(c) What is the practical value of knowing the correlation coefficients of sales and the 10 or 11 independent variables by day of week, by week and by store? Since the multiple correlation coefficients are so low, could not a better selection of variables be made by using factor analysis?

(d) Is it practical to set up large displays of peaches on Mondays and small ones on Thursdays?

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[2] With reference to footnote 5 in the Harrington-Gislason paper, bias may be present in all methods. Differences in outcomes cannot by their mere presence explain either the source or magnitude of bias.

(e) Should a retailer strive for a large display during the 9th and 13th weeks, none in the 10th and 11th weeks, and a small one the 12th week?

(f) Why are sales more responsive to size of display in some stores than in others?

(g) Are there fallacies in the methodology that cause illogical signs on the relationships between sales and defects and sales and size?

The questions above suggest many other interesting hypotheses to test before final publication. Certainly Harrington and Gislason have a wealth of data to work with and many interesting problems to face as their work progresses. Their paper, as well as the others, should stimulate a further consideration of the problems confronting the price analyst and the methods needed for their solution. If this can be accomplished for all who read and hear these papers as well as it has been for me, then I am sure this has been a worthwhile session.

CHANGING REQUIREMENTS FOR AGRICULTURAL DATA

Chairman: J. E. Crosby, Jr., Federal Extension Service, USDA

AGRICULTURAL DATA REQUIREMENTS IN EXTENSION WORK

DORRIS D. BROWN
Mutual Federation of Independent Cooperatives, Syracuse, New York
AND
J. B. CLAAR
Federal Extension Service, USDA

EXTENSION workers, at all levels, are heavy users of information showing quantities, grades, values, prices, and movement of resources. Sometimes they want this information for the local community or county. At other times, they want state and national data.

A survey made in 1954 by Ebling and Ahlgren at Wisconsin shows that extension-worker requests for data were roughly one-fifth for national data, one-fourth for state data, and one-half local. A repeat survey made by Ebling and Ahlgren in early 1956 shows a shift toward more local data requirements. Now extension-worker data requirements are approximately one-eighth national, one-fourth state, and two-thirds local. The volume of national and state data requirements has remained the same. The change has been in the need for local data to service farm and home development, program projection, marketing, and other new or enlarged agricultural activities at the county and local levels.

Agricultural data used by extension workers serve to improve decisions made by five important groups in our society. These groups include the individual farmer and his family, neighborhood and community groups, government policy makers and administrators, business firms, and consumers.

The need for agricultural data is growing faster than the supply. This growing need is associated with extension's increased emphasis on farm and home planning, program projection, marketing and rural policy activities. Our growing population, expanding economy, and regulatory programs in agriculture have added to the needs for timely, complete, and accurate agricultural data.

Farmers throughout the nation make frequent decisions regarding what to produce and how much to produce. Agricultural data are used here to arrive at judgment decisions regarding price and cost expectations. For example, the expected price for cotton, beef cattle, hogs, and feed grains for the next 1 to 5 years helps many a southern farmer decide how much of each of these commodities he should produce. Timely, complete

and accurate agricultural data are needed so that farmers can make the best possible production and marketing decisions.

Government is among the heaviest users of agricultural data. Government workers at all levels use agricultural data to improve their efforts to arrive at decisions regarding support levels for farm products or a soil bank program, or to administer acts of Congress or the state legislature, or in research or marketing activities. The uses made of agricultural data are unlimited. Here, as with local leaders, farmers, and business firms, timeliness, completeness, and accuracy are important.

The Problem

In recent years, while our demand for agricultural data has been growing, our supply of certain types of data has been declining. The trend is away from local and county data. Useful agricultural data, formerly collected and published on a local basis in the Census of Agriculture, are no longer available. Useful data formerly collected and published by the U.S. Department of Agriculture on a county or state basis are obtained by sampling techniques. Recently, added funds have been used to increase the amount of sample-type data collected.

This type of data, while considered accurate enough for national decision making and administration, is not accurate enough to be very useful at the local level and in many cases at the state level. Some of it is not published and made available for general use. The trend is away from local and county statistics. However, the demand is for more data concerning local and county activities. Local and county data can be combined into area, state, or national data.

Another problem is the accuracy of data available to extension workers and others. A current state agency report frequently misses estimated milk production and utilization data by 20 to 25 percent. Recent variations in estimates of cotton and of the pig crop have contributed to errors in decisions of farmers, business firms, and government. Frequently, the compilation and publication of agricultural data are made available too late to be of maximum value in pricing and moving farm products through marketing channels to consumers.

Many extension workers are not fully informed of all the agricultural data that are available. Some of them need help in collecting and using agricultural data.

Survey of Data Needs

Recently, a survey was made of extension's agricultural data needs. From this survey it was hoped to learn what the gaps are in the types of data being collected and what improvements are needed in the form or frequency with which they are collected and reported. Forty-six states

and 3 territories responded to this survey. Almost all of the reports were based on committee study and many states conducted surveys of state specialists and county personnel to determine the needs for statistical data. Various other people with contributions to make to this topic, such as the state statistician, were frequently members of these committees.

The states were asked four questions:

(1) What data are needed by the Agricultural Extension Service in our state?
(2) What data that we now get do we want to continue to get in their present form?
(3) What changes are suggested in the type or form of data now available?
(4) What additional data, not now available on a state level, county level, or minor civil division level, etc., do we need to enable us to do a better job of planning future operations and measuring results in the Extension Service?

The answers to questions one and two emphasized the important place that statistical data of these types have in state extension programs and with few exceptions stated a strong desire to receive all of the data that are now being collected and disseminated.

In connection with present data, the states repeatedly requested an up-to-date master index and bibliography of data that are available. This should show the item that is collected, its frequency of collection, date it is available, etc. It should also be cross referenced. The need for close coordination among various data-collecting groups was also stressed.

In answer to question number three, it was frequently suggested that more charts and graphs be used to present data. It was also suggested by several states that more data be reported that show the trends and the range in important items. The answers to this question emphasized that the frequency and accuracy with which data are collected, and the speed and methods of disseminating them are very important to users of data in the Extension Service. Some suggestions were received for further training of data-collecting personnel.

In answer to the last question, where the requests for new data were solicited, a broad list of data was requested. In addition to these items of new data, many items that are now being collected were requested at a different level or frequency, or with further breakdown or cross referencing. These data requests varied by states and regions, indicating the differences in the agriculture of the regions and the variation in data emphasis that is required to serve them.

Some of the requests were for very detailed information within a given subject-matter field, indicating the detail needed by subject-matter specialists in carrying out a program. Probably the most striking thing about the requests for new data was the large amount of data requested on a county basis. Every state mentioned the need for more local data. Hun-

dreds of requests were received for specific times of new data on a county basis. The expansion of extension activities along the lines of the farm and home unit approach and county program projection where the county forms the unit, has caused an increased awareness of the need for local data of this type. In order to project a county program, data are needed on the trends taking place on farms and in the community, as well as the competitive position of the area with respect to other producers of the commodities. In order to assist a farm family to do a realistic job of planning, much information on the costs and returns of various enterprises is needed as well as market data and frequent information as to anticipated production. The major categories of data requested in the survey were as follows:

(1) State and county data were requested regarding the production of crops and livestock on a quarterly or monthly basis, as indicated by the production cycle. Included in the list were livestock, fruits and vegetables, flowers, and specialty crops. These data are needed to provide more detailed and frequent data as a basis for planning production and anticipating marketing and price changes.

(2) More county and state information on farm and nonfarm income with additional breakdown and cross referencing as to size of farm, type of farm, age of operator, source of income, etc. Similiar information was requested on major farm cost items. There were several requests for more cost of production data on crops and livestock. These additional data are needed particularly in assisting with evaluating the opportunities of individual farms in farm and home unit approach work and to evaluate the competitive positions of regions in connection with county program projection.

(3) Additional state and county information on the use of major production practices and farm equipment, particularly new practices and equipment. The investment in machinery by major machine was also requested. These data are needed to aid in evaluating progress farmers are making in adjusting to technological progress and in locating problem areas.

(4) Separate irrigation from nonirrigation production, particularly in the western irrigated areas. Data were also requested as to the irrigated acreage of crops and the source of water, type of equipment, cost, etc. With such widespread interest in irrigation, more data are needed concerning costs, returns, and methods of irrigation. In areas where both irrigation and dryland farming occur, data are rather meaningless for many purposes unless a separation is made.

(5) Provide additional information needed to trace the movement of farm products via rail or truck, both in and out of states.

(6) Provide information in an increased quantity regarding the destination and utilization of all farm products.

(7) Additional price information is needed by grades and classes.

(8) Much additional information is needed for forestry crops, fruits and vegetables by grades and uses, and specialty crops. This information would include price, utilization, production, etc. This points up regional differences in data needs. Present data need to be expanded on minor and specialty crops that are extremely important in some regions.

(9) Major requests on both a state and a county level were received for additional information regarding family living and community characteristics. These requests for information covered facilities for living, family living practices, characteristics of the rural family, income and distribution for family living expenses, part-time farming, and off-farm work by sex. Current data along these lines need to be expanded in order to furnish the information that is needed to indicate problem areas and to plan, carry out, and evaluate extension activities.

If the accuracy of decisions is to be improved, we need more timely data, more complete data, and more accurate data. We need to know more about the data that are available. We need to know more about how to use agricultural data. A good job of analyzing and interpreting data is a necessary step in making data useful and meaningful.

The need for these data is clear. The question arises as to how they can be gathered and assimilated for use in the most efficient and effective way. Although the federal government can be expected to obtain some standardized information by counties, states, and MCDs, it would seem that some of the local data needed for extension activities will have to be supplied locally. Some of the items requested will probably have to come from research activities rather than from usual data collecting. Regular collecting of data by states or counties, together with special probes or surveys to get information on rapidly changing situations, seem essential to a well-rounded attack on this problem.

Your Committee's Program

Much can be done to improve our agricultural data situation. Plans are under way for the development of a bibliography of agricultural data, and reports currently available from the Census Bureau and the Crop Reporting Service. It would be helpful for each state to supplement this with a state and county bibliography.

Now under study is a program to train county and state extension workers to collect and use agricultural data. This program could be most helpful in that much of the data needs are at the county and local level.

Strengthening the state data-collecting organization to supplement what is done from the national level would be helpful in many states. Continuation and improvement of services by trained personnel in state offices of Agricultural Estimates is a key to the problem.

It would seem that the first step in moving toward fulfilling the needs indicated by this survey is the determination of the degree that it is practical to meet them from the national level. Then, states and counties can develop supplemental programs to meet their special requirements. At the national level, changes are now under way that are designed to supply some of the data needs indicated in the survey summarized here. The Department of Agriculture is readjusting its use of available resources to provide more timely, complete, and accurate data. The Census Bureau is carefully re-examining its approach to agricultural data needs, with particular emphasis on minor civil division data.

The Congress has requested the Department of Agriculture to appraise the work of your committee to study further the need for statistical data and to make recommendations for budgetary requirements in order to supply at least the more important parts of the needed data. Further action on this program is anticipated this fall and winter.

Two things are needed at the national level to achieve our objectives of more timely, complete, and accurate agricultural data. First, is further recognition by the Department of Agriculture and the Census Bureau of the responsibility for leadership and at least partial action regarding the collecting and publishing of needed county and local data. The second need is for added funds to do the job. These problems and solutions need your serious study and action if agricultural data are to serve their function of improving decisions.

DATA REQUIREMENTS IN AGRICULTURAL ADMINISTRATION AND RESEARCH

MARION D. THOMAS
Oregon State College Extension Service

IT STRIKES me that this subject of data requirements in agricultural administration and research could be treated broadly or briefly. Of necessity, I must treat it briefly.

Yet, I hasten to add that my treatment is not likely to do the subject justice, for much could be said and written to improve the understanding and appreciation of the ever-growing need of administrators, research workers, and others for more timely, more detailed, and more reliable facts and figures.

During the past 18 years as an agricultural statistician and an extension specialist in agricultural economics, it has been my duty and privilege to try to satisfy numerous consumers of data with the products of the official state and federal statistical-gathering agencies. Important among these consumers of statistics have been administrators and research workers. Like most consumers, their appetities have grown, especially their appetites for variety and convenience.

A check on the number and nature of requests serviced by our office during the past two years reveals that administrators have been most interested in two things: people and money. Numbers of people, their age, their location and other sundry characteristics vie for top place in administration interest. Administrators are repeatedly faced with the need for justifying projects and the associated expenditure of public money. How many people are affected? Who are they? Where are they? Who will benefit? Data are needed to answer these questions.

These initial questions are hardly answered before the calls start coming for evidences of benefits and accomplishments. Has production increased? Have yields been boosted? What has happened to income? Have costs been cut? Is use increasing? Has our market area expanded? What have the responses been to this and that? The proof of success or failure, of accomplishment or lack of it, often hinges on what the figures show.

Numerous and detailed as data are, we find administrators ask questions that can't be answered—at least on the basis of figures regularly gathered in the past. We find them asking more and more about new or specialized crops, about localities, counties, type-of-farming districts, production and marketing areas.

Pressing for our attention at the moment is a request for figures on the acreage, number of growers, income, persons employed in harvesting

and processing and the like in one of Oregon's specialized fruit and vegetable areas. The experiment station wants to know, the people want to know and the legislature will hear about it, because there are unsolved production and marketing problems in the area—because an experiment station is wanted there. A national, state, or regional station is not enough. A local branch station is wanted and perhaps needed. So national figures, regional figures, or state figures are not enough. Local, county, or district figures are wanted.

Fortunately, cooperation between state and federal fact-gathering agencies has advanced in Oregon to the point where fairly satisfactory answers to most demands for county and area data can be supplied without extending special efforts in the field.

Also pressing for attention is a request from another administrator. The Soil Bank is his main concern at the moment. He wants to know the acres of non-irrigated crop land, the sales price of such land, current rental rates and yields of typical crops. And he wants the figures by counties. Certainly he is generous and understanding for he concludes his request by saying, "Even if there are many blanks, this will help committees determine local rates of payment."

Will he and the committees be satisfied with figures for 1954? Can they interpret census figures on value per acre of all farm land and buildings into value of non-irrigated crop land of the type that concerns them? Can census figures be recombined to give the crop-land figures desired? Will yields of selected crops in census years be sufficient for crops like barley and oats? We hope so, for we know of no better source at the moment.

Now, may I ask, is it right, is it efficient that the spending of so much depends so heavily on so little? Don't we need greater recognition that reliable figures can't be produced at the drop of the hat; that they don't just grow on trees; that time, foresight and money are needed to produce the facts in numerical form? Wouldn't these facts help avoid losses, waste and inefficiencies much greater than the cost of the figures themselves?

Besides data on people, their incomes and spending, our records show agricultural administrators are interested in a wide variety of other figures. These include changes in numbers and types of farms, land uses, crop acreages, livestock numbers, trends in consumption, land values, changes in efficiency, importance of agriculture compared with other industries and the like. More and more of these requests are concerned with county and local areas.

Apparently in top demand by research workers are figures on prices of farm products and food at various points in the production and distribution system. Coming in close second and third are requests for crop acreages and crop production. Livestock numbers, crop yields and

livestock output per animal, crop values, utilization, prices paid, marketing costs, demand indicators, foreign trade, government programs, farm income and expenses, rank high on the extensive list. Here again there are evidences of a demand for more and more local data with no diminishing interest in state and national figures.

Before studies are started, research workers use statistics to help discover and describe the size and nature of a problem, and to help explain how it developed and why the problem is of public concern. They use much data in the course of investigation, especially in economic studies of inter-relationship and of cause and effect. Often research workers use various statistical indicators of change as a means of keeping results current. For instance costs of milk production obtained in special surveys are interpolated from month to month with a fair degree of accuracy by applying indexes of change in wage rates and feed costs.

Earlier, increasing demand of data consumers for convenience was mentioned. We find administrators especially want their data in convenient capsule form. They seem to prefer tables or charts that make a single point. They would rather have four or five of these simple aids rather than one table or chart that makes five or six points. Perhaps more time and attention needs to be given to organization and presentation of statistical data.

Recently I have been especially impressed by multilith publications of the Foreign Agricultural Service. They are well organized and well illustrated. The outlook chartbooks and situation reports issued by Agricultural Marketing Service have been greatly improved. In Oregon, we are producing a package of significant national, state, and county production and marketing data that has proven quite popular. We call them Oregon Commodity Data Sheets. They are brought up to date once or twice a year and are used widely by our county agents and extension specialists. If nothing more, they save data users a great deal of digging through a large number of reports. They provide convenience.

LOCAL DATA REQUIREMENTS IN AREAS OF HIGH AGRICULTURAL SPECIALIZATION

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AREAS of specialization in the production and marketing of agricultural products are not uncommon in the United States. These areas are not confined to any one portion of the country. They exist from Maine to California; from Florida to Washington. Although specialization usually has been associated with fruits and vegetables, there are sections of the United States where livestock and poultry production also has become highly specialized.

Generally there is more than one reason for specialization today. These reasons tend to vary with the physical nature of the region, with the time of agricultural development, and with the background of the people themselves. Climate, soil and topography are generally considered to be the major physical factors leading to a high degree of specialization. Quality of product, transportation, distance to market, the efficiency of production, and even the inertia of established industry, in some cases, play a part in regional specialization in agriculture. As a general rule it appears that the greater the number of factors leading to specialization, the higher the degree of specialization.

Although areas of intensive production are found throughout the nation, there are probably more of the highly specialized agricultural areas in western United States than elsewhere. This is especially true in the Mountain and Pacific Coast states. In these two regions there are many reasons for specialization.

1. *Topography.* Probably the most important factor is topography. The Mountain and Pacific Coast states are generally mountainous producing areas with essentially the same climate. These areas are often effectively separated by barriers to transportation and communication. Topography is an important element in determining climate. Elevation is another factor in specialization directly related to topography.

2. *Water.* Most of the highly specialized agricultural regions in western United States depend upon water for irrigation. Even the humid areas of Washington and Oregon are turning more and more to supplemental irrigation where specialization is important enough to warrant additional costs. Actually, many more acres in western United States could be served with existing irrigation systems if the slope would permit irrigation or if the costs of leveling were not prohibitive.

3. *Soils.* Soils are a factor in some areas. Certainly they are important in the localization of certain fruit crops and vegetables. Oftentimes sub-

soil is more important in determining crops in the western areas where irrigation is practiced than is the topsoil.

4. *Climate.* Because of irrigation, precipitation is much less important today than in the past. However, sunshine and temperatures are certainly basic to the quality of fruits, vegetables, berries, hops, seeds, and mint crops which are so concentrated in western United States.

5. *Distance from market.* Western producers primarily depend upon midwestern and eastern markets. Because of costs of transportation, specialization in the production of certain varieties and in quality of product, as well as marketing efficiency, has become most necessary. For many years specialized areas were limited by the dependence upon rail transportation, especially by access to rail transportation. Today truck transportation has enabled the specialized areas to expand areawise. There are new areas developing simply because they have become accessible.

6. *Efficiency of production and marketing.* Areas of specialization tend to attract experiments and research in production and marketing. Because of this they tend to become even more efficient, both in the production and marketing of the product than the less specialized areas. Unit costs are so important because of distance to market, that they tend to force the adoption of new methods.

Demand for Data

Highly specialized areas in western United States are avid consumers of agricultural information. As a general rule, the level of education among producers in the highly specialized areas is considerably higher than the national level. Usually, too, there are organizations to which these producers belong that bring them predigested information which whets the appetite for more. Those engaged in buying, storing, and marketing these agricultural products also are above the average in education. More often than not, the marketers are also producers in their own right or have financial interests in production. Accurate and timely information is vital to these people.

In the field of agricultural data these people depend upon a variety of sources. Government offices—state and federal—furnish considerable data, some of which is analyzed in capsule form through the extension services, land grant colleges, and state departments of agriculture. Private agencies also present and analyze government data. However, increasingly important sources are (1) general farm organizations; (2) quasi-government commissions, such as the Washington Apple Commission; (3) organizations that process or market agricultural products; (4) national commodity organizations, such as the International Apple Association; (5) local marketer associations; (6) local producer associations; and (7) certain large cooperatives. Normally, these latter groups are great consumers as well as

producers of agricultural data. However, almost everyone named has some special needs that can only be met by collecting data in the particular field in which they operate.

On the Pacific Coast, in recent years, there has been a great expansion in grower-marketing and producer-bargaining organizations. Some of these have been organized in the form of federal control boards. More, however, have been organized under state legislation that permits a commodity group to set up an agency to promote research on the uses of, and marketing of their product, and to conduct vigorous advertising programs. Producers also have set up associations designed to bargain with buyers, shippers and processors. The need for detail, especially local area detail, by these agencies and also by the groups with whom they bargain has been very great. The primary need of these groups has been historical data in convenient, usable form. Because much of what they want has not been available, part of their program has been to attempt to provide themselves with the data.

National Data

There has been little demand for national data in these areas of high specialization. So much has been provided for so long that people take it for granted. If it were not provided there would be a great demand. In addition and at the same time, however, the need at the national level —so far as the specialized areas are concerned—has been for current information such as varietal data, especially where variety affects time of marketing. This information is not now provided. Better information as far as quality, as reflected in national totals, is also needed. Fruit growers, for example, would like to see fruit prospects reported in more than general terms so far as quality is concerned. Price data on a crop at the national level with a wide range of varieties and quality, and with a variety of utilization, are of little direct use in the specialized regions. Many times the specialized areas need more frequent commodity estimates than are now available.

State Data

State data are more in demand than national data. Of this, too, it can be said that the demand is not great because it has long been provided and that it is taken for granted. However, many marketers are frank to say that state figures are more valuable than national figures because they come much closer to providing them with information they need on competing areas. Certain states are competitors, others are not. Certain states compete in certain varieties only. Here again the specialized areas need variety, quality, and more detailed price data than is currently carried. The need for historical information is more pronounced at this

level than at the national level. Trends in competing areas are more important at this point.

County Data

County data are much more in demand than state data. Some people say this is because information is not generally available. This is true. The demand is there because there is a definite need. Practically everything that is available on the national level is needed on the county level. Requests for such figures come from all segments of agriculture and the fact that they continue to grow rather than diminish is indicative of the need. Another clear-cut indication of need is the fact that the announced program of many of the new producer organizations is to provide themselves with more county and local area data than is now being provided by the usual governmental sources.

As specialized areas gain a reputation for quality and volume production, they attract more processors and service industries. In considering initial investments these industries need all the county and local area data they can obtain. Processors request data on the past, present and potential supply of raw material usually by precise location in order to arrive at a decision as to when and where to enter into competition. Service industries related to agriculture contemplating expansion into or within a specialized area likewise are interested in figures that show the location and potential of their market. Those who do the most careful job of analysis often request information explaining the short-time and long-time trends shown in acreage, yield or production data.

Often the most active demands for county and local data come from commercial and civic organizations interested in attracting new industries and investments to their area. This is especially true in the western states which have an expansionist viewpoint. In Washington state a Community Development Bureau, connected with the University of Washington, has created wide interest on a local level for economic data that can be used for attracting new capital.

Two recent developments have greatly increased the need for county and local area data. One of these is the farm and home planning program of the Extension Service. The most recent is the Soil Bank Program with its acreage reserve and conservation reserve. In both programs county information is essential. In the highly specialized areas of the western states, planning at the community and individual farm level requires information below the county level. All too often, county data are misleading—in part because of the size of the units.

Many of the counties in the western United States, which contain highly specialized agricultural areas, are extremely large. Of the 100 largest counties in the United States in land area, 97 are located west of the Mississippi River. The other three are all in the state of Maine.

Twenty-one of the 100 largest counties are in the three Pacific coast states and 71 are in the Mountain states.

The 100 largest counties range from San Bernardino, California with 20,131 square miles to Pescataguis and Somerset, Maine (tied for ninety-ninth) with 3,948 square miles each. Nine of the 100 largest counties have areas ranging from 10,000 to 20,000 square miles each, fifty-one have areas varying from 5,000 to 10,000 square miles, and thirty-six range from 4,000 to 5,000 square miles in size. By comparison, the states of Delaware and Rhode Island are smaller than the smallest of the 100 largest counties. Connecticut, Maryland, Massachusetts, New Hampshire, New Jersey and Vermont also have less than 10,000 square miles each.

Counties in the various geographic divisions of the nation average as follows:

New England	940 square miles
Middle Atlantic	670 square miles
East North Central	580 square miles
West North Central	820 square miles
South Atlantic	460 square miles
East South Central	500 square miles
West North Central	920 square miles
Mountain	3,150 square miles
Pacific	2,420 square miles

Of course, size alone is not a measure of the importance of a county from an agricultural standpoint. Nevertheless, it is significant that 14 of the 100 largest counties were among the 100 leading counties in the value of agricultural products sold in 1949—the latest date for which such data are available. The five leading counties in value of production are among the 100 largest counties and 7 of the first 10 are among the 100 largest counties.

Local Area Data

In practically all cases the agricultural production of these large counties is concentrated within only a small part of the county. Sometimes there are two or more highly specialized areas within a county, each with some characteristic that makes them differ in some degree even though they are producing the same commodity. In such counties, county data lose their significance and are decidedly less useful to those engaged in the transportation, storage and marketing of the crops.

The need for local area data largely arises from the same factors that lead to specialization. Many specialized areas cross county and state boundaries. Local area data, which can be combined into regional totals without respect to political boundaries, are essential in the very highly commercial agricultural areas. It is no accident that the Winter Pear Control Board, which regulates the marketing of D'Anjou, Bosc, Comice, and Nelis pears in Washington and Oregon, has recognized a Mid-Co-

lumbia producing area that embraces the Hood River region in Oregon and the White-Salmon–Underwood region in Washington.

The place of local area data can be typified by the needs of the fruit industry in the state of Washington. More particularly, these needs will be related to two specific counties. Although fruit was selected as a case study, what will be said applies equally to potatoes, hops, mint, seed crops and sugar beets. It applies to vegetable and berry crops in western Washington.

The state's apple industry is supplied with some local data. This is because of the importance of the state in the national picture. In most years, one out of every four or five apples is produced in the state of Washington. Twelve commercial counties in the central and eastern portion of the state account for 99.4 percent of the state's apple crop. Four counties–Chelan, Douglas and Okanogan in the north-central section and Yakima in the south-central portion–contribute about 97.8 percent of the crop. The investment in sorting, grading, packing and storage facilities to handle the apple crop in the commercial counties is tremendous.

Through the Washington State Apple Commission the apple industry provides itself with production estimates by varieties for five sections of the state. There are two primary areas: (1) the Wenatchee–Onkanogan, which embraces Chelan, Douglas, and Okanogan counties; and (2) the Yakima area–Yakima and Benton counties. Estimates are also prepared for (3) the Lower Columbia; (4) the Snake River area; and (5) the Spokane area. Two traffic associations and two marketer associations provide shipper-members with storage reports by variety, rail and truck movement by variety, and prices by size and grade for the two major areas of production, but these are not available to all people.

Even with these data there are continuing requests for more local area information on apples. The regions are too broad. Data are needed by individual counties and by subareas within the counties. Request for subarea data are not confined to any one segment of the industry. Growers and grower organizations, such as the various horticultural associations and the Washington Growers Clearing House, are making continuous demands for more local detail. It would seem that fruit growers make more plans on the basis of local trends than they do on national or state trends. There are necessarily long-range plans because of the length of time involved before trees become commercial producers.

Even more vociferous are the demands by producer-bargaining associations for Bartlett pears and peaches. Processors are constantly seeking more detail, especially with respect to varieties and planting trends. So are the marketers. Cooperatives, such as the Big Y, the Horticultural Union, and the Wenoka Federation, with growers spread throughout the producing areas, attempt to provide their own local area data. The horticultural inspectors of the Washington State Department of Agriculture

and the county agricultural agents make valiant efforts to provide local area data. For fruits not so well served as apples, there is a real demand for at least as much local data as there is available for apples. Service industries, such as recently the natural gas industry (which is just starting in Washington), are virtually concerned with fruit statistics.

Yakima County. The need for detail on fruits is especially great in Yakima County. It is one of the 100 largest counties in the nation, ranking eighty-fifth in size with 4,273 square miles. Despite the fact that only 41 percent of the land area is in farms, the county ranked fourteenth in value of farm products sold in 1949. Although there is about 10,000 acres of non-irrigated wheat, the bulk of the cropland (which accounts for 22 percent of the farm land) is irrigated by the Yakima and Naches Rivers. Much of the county consists of low sagebrush-covered ridges and brush or tree-covered foothills of the Cascades. Ahtanum and Yakima ridges separate the valley into two parts—the Lower Valley below Union Gap and extending southeastward to the Benton County line and the Upper Valley centering on the city of Yakima.

Yakima is a very diverse county so far as agriculture is concerned—yet its diversity is really composed of several specialties. Local interests call the Yakima Valley the "Salad Bowl of the Nation." Yakima County produced 45 to 50 percent of the apples in the state of Washington in the last three years. It is the state's most important producer of pears, peaches, sweet cherries, plums and prunes. There are about 4,500,000 fruit trees in the valley—at least there were just prior to the 1956 winter freeze. The fruit industry recognizes 17 different fruit areas in Yakima County. When discussing tree numbers or production trends, the question is not "What is the county total?"or even "What is happening in the Upper Valley?" Rather the questions are—"What is the Upper Naches area doing?" "What is happening in the Tieton area?" "How is the Zillah area?" Each area has its own characteristics.

The Lower Yakima Valley is warmer; trees blossom earlier. As a result, late spring frosts are generally more damaging. This in itself brings a need for local area data—more factual than the opinions which are all that is available now. However, even in the Lower Valley the fruit areas are separated by physical features. Elevation, slope and soil all play their part. In one area apples predominate. Soft fruits predominate in another. Other sections are very mixed. Difference in the time of irrigation development has been a major factor in varietal differences. For example, the earliest apple areas from the standpoint of planting tend to have more Standard Delicious, Winesaps and Jonathans, whereas the later areas have more Red Delicious, Golden Delicious and Red Romes. Differences in types of fruit and varietal differences result in different harvest and marketing periods.

In the Upper Valley the various producing districts are usually sepa-

rated by very distinctive physical features. Elevation plays a very important part. There are differences due to period of development just as in the Lower Yakima Valley. Figure 1.

There is a real need for data on tree numbers and production by variety by area. Never was the need greater than right now. In November 1955 a freeze caught many trees still growing vigorously. Some apple and pear

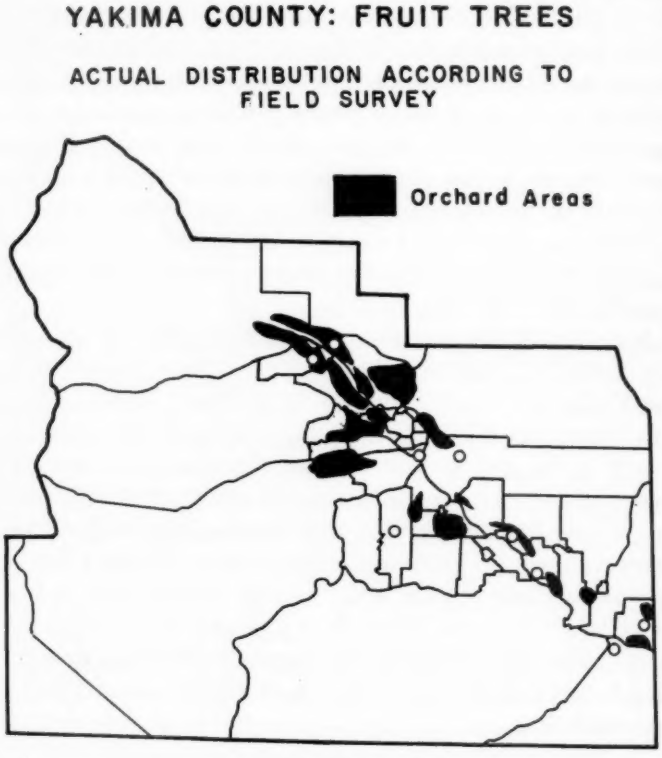

FIGURE 1.

trees had fruit unharvested and all were fully leaved. This interrupted the progress of the trees toward dormancy so that low temperatures that came in January 1956 were more injurious than they would have been otherwise. Cherries and prunes suffered even more than apples, with old and young trees being killed outright. In apples, the chief mortality was in young trees intended for replacement. Old trees suffered less damage. Local area data are needed to assess the damage that will affect these areas for 10 to 20 years. There also will be a need to have data on replantings. Some sections will not replant. Some will show marked changes as growers change their programs. Marketing and transportation will be vitally affected.

Census minor civil division data are helpful, but do not answer all the needs of the fruit industry in the Yakima Valley. For one thing, much of the data are needed more often than every 5 years. Large blocks of 1956 plantings will come into commercial bearing in 1961 or in 1966, depending upon the fruit. This will be just after a census and the influence upon production will be greatest in the years from 1966 to 1970. Secondly, there

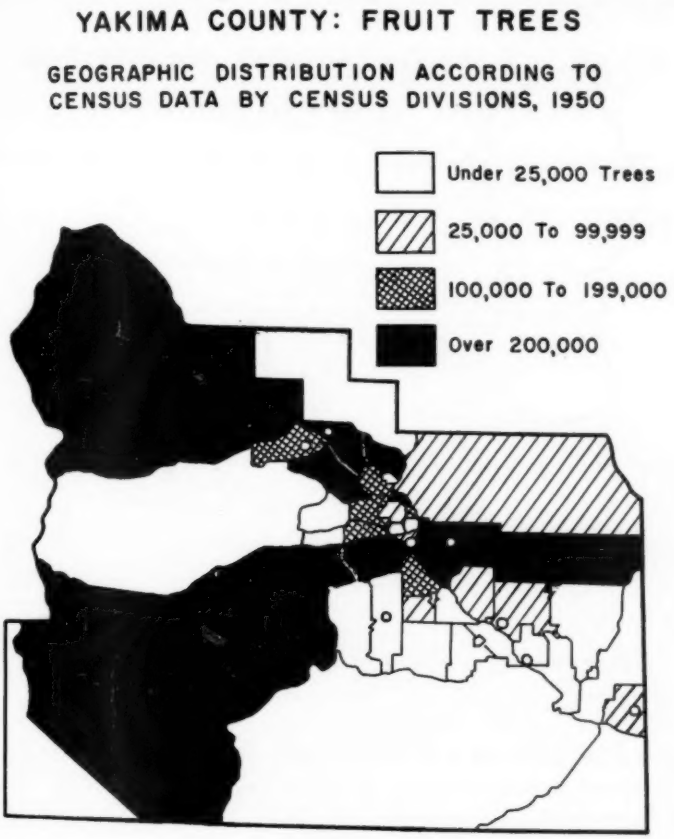
YAKIMA COUNTY: FRUIT TREES
GEOGRAPHIC DISTRIBUTION ACCORDING TO CENSUS DATA BY CENSUS DIVISIONS, 1950
Under 25,000 Trees
25,000 To 99,999
100,000 To 199,000
Over 200,000

FIGURE 2.

is no varietal information. Thirdly, the 40 minor civil divisions in the county aren't particularly suited to providing the local area data needed. Washington is fortunate to have census districts that will never change because of reapportionment as was the case with election districts, but the census districts are more suited to population than to agriculture. This is suggested in Figure 2.

The census districts cluster around the city of Yakima. When these units are superimposed on the orchard areas it is noticeable that they

sometimes are located only in a small part of the division. For anyone unfamiliar with the county, census data would be extremely deceptive. Census District 20 leads into very mountainous areas just east of Mount Rainier. Actually, the orchard areas do not extend very far up the Naches River. Even more deceptive is District 22. Orchards are concentrated on a few ridges in the northeastern portion of the district. The rest of the irrigated eastern portion is too level for fruit and supports hops, alfalfa, mint

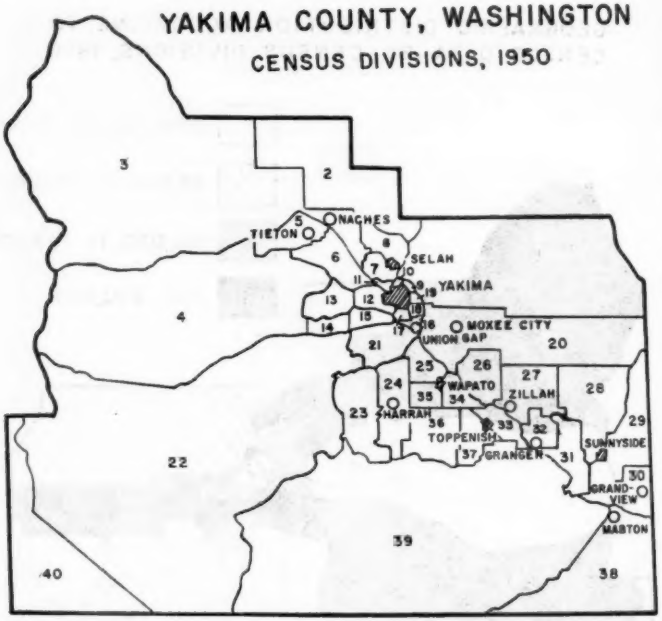

FIGURE 3.

and vegetables. Most of it is foothill range land leading to Mount Adams. Fruit is concentrated only in a small part of District 2. The rest is devoted largely to hops and dryland wheat. Much is sagebrush sheepland. Figure 3.

Okanogan County. Census divisions actually are fairly satisfactory in north-central Washington. There the population is predominantly agricultural and the agriculture is predominantly horticultural although wheat and cattle are important too.

North-central Washington is mountainous. Ribbonlike orchard areas follow Columbia, Wenatchee, Okanogan and Methow rivers. They are located on benches that vary from near river level to 1,000 to 2,000 feet above the river. Orchards sweep around the edges of the mountains and up into the narrow tributary canyons. The orchard districts are interrupted

by land that cannot yet be irrigated, on soils that are not suitable, or where the mountains come right to the river's edge. Figure 4.

Okanogan County is one of the most interesting of the three north-central counties. There are orchard areas along the Columbia River, up the Okanogan River to the Canadian boundary, and up the beautiful Methow River Valley. The county is the fifty-third largest county in the United States. Because of the large cattle ranches 52 percent of the land

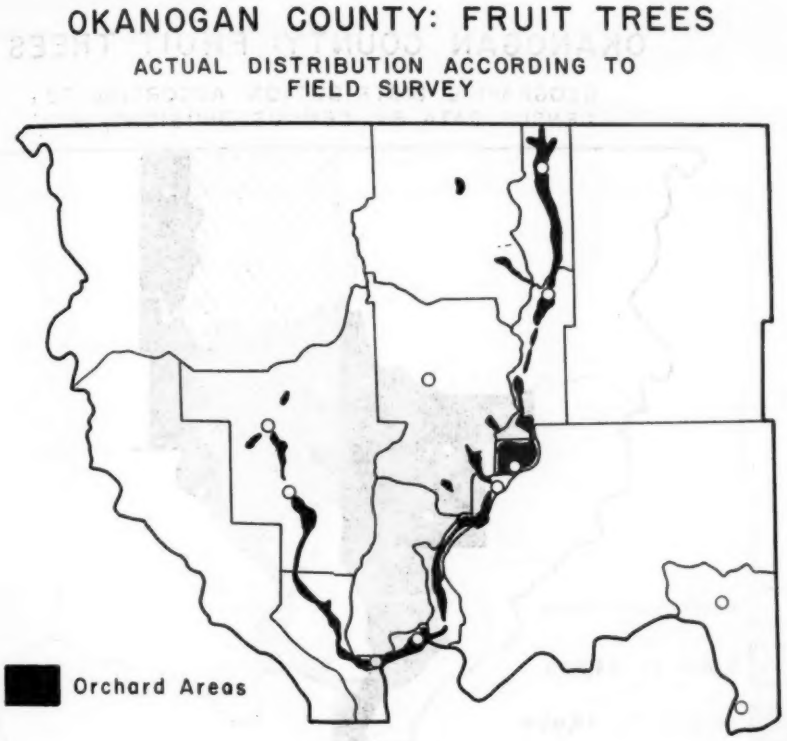

FIGURE 4.

is in farms and the average size of farm is nearly 1,000 acres. However, only 7 percent of the land in farms is cropped and only .9 percent of the farm land is in orchards.

Although apples predominate in the entire county, soft fruits and winter pears are grown too. Because of elevation and favored location, the harvest season in some areas is three to four weeks ahead of the harvest in other sections. One of the earliest is also one of the northernmost. Most of the large terraces or benches are served by small villages or cities in which are located the storage and marketing facilities. Three places serve the Methow Valley. Orchard areas are located in 10 of the 16 census

divisions in the county. The divisions show the differences much better than in the Yakima Valley. In only three districts are the local census data deceptive. Fifteen different fruit sections are recognized in the county, some of them fairly small and relatively isolated. Here time of development plays an important part in the type and variety of fruit that is grown. Red Delicious apples predominate, especially in the lately developed areas. It is an area in which orchard expansion is still in progress and where there will be continued development for many years. Figures 5 and 6.

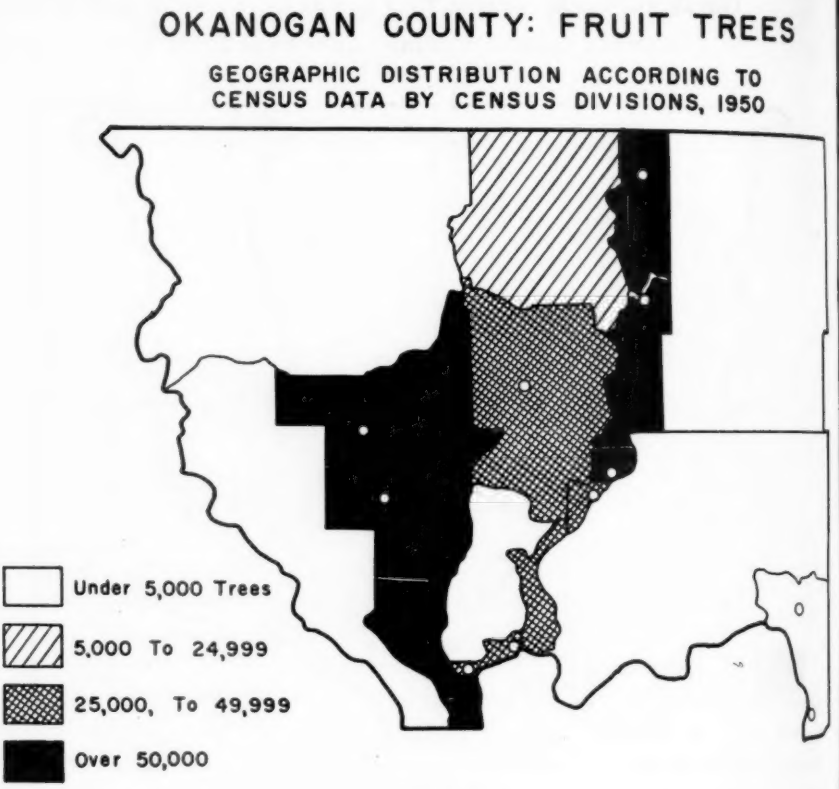
OKANOGAN COUNTY: FRUIT TREES
GEOGRAPHIC DISTRIBUTION ACCORDING TO CENSUS DATA BY CENSUS DIVISIONS, 1950
Under 5,000 Trees
5,000 To 24,999
25,000, To 49,999
Over 50,000

FIGURE 5.

Reports of the Traffic Association include Okanogan County with Chelan and Douglas counties. Therefore, the shipments and storage reports for the Wenatchee Valley are much less useful to producers, buyers and shippers than is true of the Yakima Valley where Yakima dominates the Yakima Valley totals.

Summary

Although the needs of the fruit industry in two Washington counties are used as examples of the data requirements of highly specialized areas,

the story could be repeated for many other crops, in many other counties, and in many other states. The very factors that lead to specialization also lead to demands for data in less than a county level. Areas of specialized production also are areas with specialized marketing, storage and transportation problems. Decisions involving an industry that brings to the state's orchard growers $120,000,000 per year, and that involves many more millions before the fruit reaches the consumer, often are made with inadequate information.

Piecemeal attempts to provide the local data are being made by segments of agriculture, but there is no planned method of providing local

FIGURE 6.

area data in these highly specialized areas. Piecemeal attempts are never very satisfactory. In the first place, such efforts by a number of groups result in duplication and increased costs of providing information. Piecemeal efforts do not insure that those who most need the data actually can get it. Too often the specialized producers are too few numerically to provide the necessary funds to obtain the information necessary for the most efficient marketing. In many cases only one segment of the marketing system has the material needed by all. In addition, unanimity of opinion on what actually is needed is difficult to obtain where these specialized areas are separated by pronounced physical features or where there are great

varietal differences. Unanimity of action is even more difficult to obtain where specialized areas extend across state lines. Another great handicap is the lack of knowledge required to secure and to analyze data.

The real need of the specialized agriculture is an organized program at the national level to collect, assemble and analyze the material needed at the local level. Such a program can provide the leadership that is necessary. It can provide the skills that are necessary. It can better analyze the needs of the many similar areas that are separated by hundreds of miles and often by state boundaries. It can reconcile the differences in dissimilar areas. An orgaized program at a national level will better provide equality of treatment for grower, buyer, shipper and processor.

Areas with a high degree of agricultural specialization are not served adequately by today's methods or by today's data. As the trend continues toward greater specialization in agriculture, this becomes more obvious. These needs must be served. To do it properly is today's challenge to agricultural leadership.

DISCUSSION: AGRICULTURAL DATA REQUIREMENTS IN EXTENSION WORK

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The writer commends the authors of this paper for making an excellent summation of the changing needs and requirements for agricultural data as seen from the vantage point of extension teachers. Basic agricultural data is needed as a background for developing sound extension teaching programs at state, county, and local levels. Furthermore, extension workers should be provided with basic resource data to pass on to their learners. In the earlier days extension workers to a large extent spent their efforts in providing farmers, farm leaders, and agricultural technicians with answers. They tended to make the decisions for their clientele. Although this tendency still persists, extension workers are coming to realize that in a democratic and dynamic society the learners make the decisions. The teacher provides basic resource information, suggests how to organize the data to determine alternatives, and finally how to select the alternative that promises optimum returns. Thus, the teacher adds to the experience of the learner prior to his moment of decision making.

According to this concept learning and planning are identical. Planning, too, is that which precedes decision making. Rational planning broadly conceived may be broken down into four quite distinct phases: (1) a systematic *appraisal* of the means, (2) *policy making*, i.e. the development of

alternative policies, (3) *planning*, i.e. the development of alternative plans, and (4) *program making*, i.e. the development of alternative programs. *Policies* may be defined as objectives, ends, or goals. *Plans* represent the means for carrying out the policies (to achieve the ends), and *programs* set forth the means to bring plans to fruition. The first phase, or the appraisal of the means, includes, *first*, an inventory and description of resources, *second*, general observations of their past and present behavior, *third*, the organization and analysis of resource data to determine past and present behavior and, *fourth*, the observation of their economic environment expressed in terms of prices of inputs and outputs. The first phase of planning, or learning, depends entirely upon the availability of basic resource data. It is this phase that Brown and Claar discussed in their paper.

Extension teaching is indeed showing sound progress when it turns its emphasis to farm and home planning, marketing, program projection, and public policy problems. Thus, it is advancing from static authoritarian teaching, where the teacher makes the decision as to the best answer for his learners and then tells them what to do when a given situation occurs, to dynamic teaching whereby the teacher either provides the resource information or the facilities through which the learners can develop their own resource information and arrive at their own answers or decisions. The dynamic teaching approach cannot get to first base unless we can provide basic resource information as a point of beginning. This holds whether our clientele happens to be individual farmers and farm families, marketing committees, local planning groups, advisory committees preparing recommendations for organizations and public agencies, or public agency administrators.

It is ironic indeed, that, in this age when the development of the arts and sciences, as they apply to the use of human and natural resources, is progressing at an increasing pace and thus calling for an increasing amount of scientific decision making, we should have reduced support for the Bureau of the Census. Such a tendency is simply contrary to the advancing efficiency of the mid-twentieth century. The use of sampling procedures constitute a means of increasing efficiency in the measurement of resources but the probabilities for error demand complete periodic enumerations (1) to provide benchmarks and a foundation for the basic statistical structure for agricultural workers and (2) to furnish minor civil division data. This contention does not preclude the desirability of the use of sample censuses on an annual basis during the intercensal years.

Minor civil division agricultural data based on complete enumeration has been subject to serious error in the past. This does not necessarily have to be. With accumulating experience and increased funds it would

be possible to improve the accuracy of complete enumerations. John D. Black has suggested the possibility of tracing individual schedules from one census period to another as a means of increasing accuracy. This technique could also be used to throw valuable light on the causes of change from one benchmark period to another. True, this procedure would increase the cost of enumeration but again may we remind ourselves of the need for improved data to keep pace with improvement in the arts and sciences and provide the foundation for more precise decision making.

The Bureau of the Census, confronted with reduced appropriations and lack of interest in smaller farms by some commercial agricultural interests, is faced not only with the necessity of taking agricultural census on a sample basis, but also of drastically raising the minimum size of farms to be included therein. This would eliminate an increasing portion of our rural resources from any kind of statistical enumeration and treatment. With the current need to devote more attention to land and water conservation it becomes critically pertinent that we know more about *all* of our land resources especially with respect to present use, type of ownership, motives of owners, etc. With the gradual elimination of smaller farm units as "farms" and with the possible raising of the minimum requirements for a "census farm" the amount of land omitted from the argicultural censuses will grow increasingly larger. The legal concept of the agricultural census should be broadened to include a census of *all* land and residents ouside of the thickly settled areas.

Recognition by Brown and Claar of the need for informing extension workers on how to use agricultural data is commendable. The writer has prepared worksheets for extension workers and rural leaders for use in applying local data to local problem analysis. Such techniques need to be further developed and refined. In spite of the hazards of specialization, the extension service might well allocate some of its increased funds for the establishment of resource data specialists at the state level to supervise the processing of data into readily consumable form for state, county, and local use, and to provide the data to state specialists and county workers in appropriate form for teaching programs. Instruction and supervision should be provided for the establishment and *maintenance* of basic resource data files in county extension offices.

Recent recognition and developments by Congress and the U. S. Department of Agriculture in the work of the Agricultural Data Committee of the American Farm Economic Association are indeed encouraging and should stimulate the Committee to even greater efforts in the future.

DISCUSSION: LOCAL DATA REQUIREMENTS IN AREAS OF HIGH AGRICULTURAL SPECIALIZATION

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The paper just presented describes so completely my own observations and experiences that I can contribute most by attempting to strengthen the points Wilcox has already made. I'm convinced that each state has problems common to the others as far as agricultural statistics are concerned. Certainly I have found it so in Illinois, Virginia, Maryland, and Delaware.

Illinois has its concentrated fruit and vegetable areas with their locations depending on all the factors Wilcox outlined except water and that is becoming of more importance. Virginia has its four tobacco areas, apple and peach belt, vegetable, peanut and broiler areas, and Maryland and Delaware have theirs.

Local Data Needed Where Production Areas Cross State Lines

In these states the counties are small so instead of a commodity being concentrated in part of a county it usually is spread over several. Sometimes the areas cross state lines as the early potato crop on the Delmarva Peninsula for example. This area includes two counties in Virginia, one in Delaware, and one or two in Maryland. The area is contiguous yet there is considerable difference between the beginning of harvest at Cape Charles and in the border counties in Maryland and Delaware. In the early days of the broiler industry the Shenandoah Valley area included five Virginia and four West Virginia counties. Illinois has several apple and peach areas, each covering two or more counties. Broomcorn is in one area but covers several counties. Grapes are commercially produced in only two areas within a single county. For all these specialty crops the county is the basis for the area statistics and in some crops, like broomcorn, fruit and vegetables, township data are used to delineate the areas. Where a specialty crop area covers more than one state, there is the additional problem of comparable statistics among states.

Commodities Grown State-Wide Also Require County and Minor Civil Division Data

I think one might say that in Illinois corn and soybeans are specialty crops too—although on a state-wide scale. They have their problems also and many of them are due to the same factors Wilcox has mentioned for the others. In a state 385 miles long and 218 miles wide with a difference of two months in the growing season, every year shows a changing pattern with marked differences among areas. In mid-July of 1954 a searing heat

wave made most of southern Illinois corn a near failure, while northern counties escaped to harvest one of the heaviest yields on record. Not all of southern Illinois was affected as we learned almost at once from our weekly crop survey and personal observation. Immediately there were requests, both government and private, for an assessment of the damage and a fine line delineation of the areas by extent of injury. This breakdown, all on a county and partial county basis, was used by the Secretary of Agriculture in designating drought counties.

For these and other crops, as well as livestock, state figures no longer meet the needs of our local citizens nor of people outside who are interested in the production of these commodities. In July we are now providing a breakdown of current state acreage on a crop reporting district basis. Beginning in August we publish each month to the end of the season prospective yield per acre and production by districts. In November we compile yield per acre by counties and at the end of the season, acreage, yield per acre, production and value on that basis. The carryover varies also so now we are showing a quarterly breakdown of farm stocks by districts. Weekly reports on the progress of maturity of corn and other crops are compiled on a district basis. Annual soybean variety statistics are used on a district basis by the U.S.D.A. Regional Soybean Laboratory, extension workers, and seedsmen. A district breakdown was required because of the area adaptation by varieties. District prices on corn are used by canning companies in establishing contract prices and rental agreements. Seed corn producers, county agents, teachers of agriculture in high schools, farm organizations and railroads are some of the users of annual township acreages of these crops as provided by the State Farm Census. For the Soil Bank, county A.S.C. committees called for corn yields by townships which could be supplied only from not very recent U. S. census figures. Demands appear progressive—are never satisfied. The semi-annual pig crop report carried for a quarter century was shifted to a quarterly basis a few years ago. Now it is being requested monthly and by crop reporting districts. The county and township semi-annual statistics on this item are widely used.

County and Minor Civil Division Data Makes Comparisons Within or Among State Areas Possible

Our experience is that the only way to meet demands for area data is by the county and minor civil division approach. This would not be true if every group used the same areas, but they do not. In Virginia during World War II, when annual state production goals were being allocated by areas, our crop reporting district basic data didn't coincide with the types of farming areas set up by B.A.E. and the latter was the basis for

the allocation. Even that didn't entirely agree with what V.P.I. was using. We found the only way to satisfy everybody was to first prepare county statistics and then these could be grouped in any way desired. The same is true in Illinois. A few years ago a meeting was called at the University of Illinois to see if common areas could be agreed upon by all groups using agricultural statistics. Agricultural economics had its type of farming areas. Extension had another grouping, and A.S.C. and F.H.A. were each different. No group was willing to accept another arrangement for the sake of uniformity but at its own inconvenience. This is as it should be because each has problems peculiar to itself that can best be solved by using its own arrangement. All of these groups use county statistics so here again county statistics was the answer. County and local area statistics also solve other area problems. An example is a request for five-year average soybean production in counties surrounding a town in which a group was considering the construction of a soybean processing plant. Another group planning a grain elevator called for township figures for all the grains. I remember a request for hog production in a fifty mile radius from a town in southeastern Virginia where a new packing plant was being considered. This radius included several North Carolina counties for which the state statistician there was able to provide statistics. This request was an interstate problem if not a national one.

Agricultural Statistics Adequate Only When Needs of User Are Met

It seems to me that national and state requirements are being met more fully than are those for counties and townships. The availability of the latter have not kept pace with the growing needs of local users. More local people are engaged in planning and frequently these plans are tied in closely with those of larger groups including the federal government. For such plans, local people need the same data for their level as other groups have for theirs.

Summary

County agricultural statistics are essential, not only for agricultural work within the county itself—but because they represent the smallest functional segment of the state and national economy. Basically the county is a convenient-sized unit for administration and, although heterogenous from its own point of view, it is usually sufficiently homogenous from a state and national point of view for satisfactory economic and ecological classification. The county lends itself to regionalization in that any combination of contiguous counties can be used to form a subarea or region. Traditionally, the county is the unit organization by means of which programs or issues are carried to the individual citizen. Since elements of

farm production are dynamic and not static, annual data are required. The quinquennial census does not satisfy such requirements.

There is a trend toward greater organization so as to secure more complete individual cooperation and whether this organization stems from national or state levels, public or private, it reaches to the counties. National farm organizations have their counterpart in their county organizations.

Township data must also be mentioned because there is an increasing demand for these minor civil division figures. Local citizens use them in carrying out local projects or programs handed down from higher levels and in doing so find their old home townships have resources they were not aware of. People outside the township—even outside the state—use these local data for delineating trading areas, location of buying or processing establishments, selling school bonds. The demand for county and other local data can perhaps best be described by saying that for the most part it parallels most series now available at national and state levels. Close coordination at all these levels—federal, state and county—and the wide use of county and township data for a particular state made by private agencies in other states makes the availability of these local data a national as well as state problem.

Perhaps Mr. Wilcox and I have very sensitive ears because we seem so aware of the demands for local data, or maybe it's because we've served only in states where the demand seems great. I doubt it. I believe the demand is everywhere. Where local data are rather widely available they are taken for granted much as we accept the sun and rain. One reason I believe the demand is almost everywhere is the origin of the requests we receive for local figures. They come from many states widely scattered throughout the nation. And we know that Washington and Illinois are not the only states in which these people are doing business.

AWARD-WINNING GRADUATE STUDENTS' CONTRIBUTED PAPERS

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FISCAL NEEDS AND CAPACITY OF CONNECTICUT TOWNS*

An Indirect Approach to Equalization of Property-Tax Burdens Through State Grants

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THE study underlying this paper probed the impact, on the welfare of Connecticut as a whole, of existing methods of raising public funds for local government and distributing state grants. The objective was to develop recommendations for improving the state grant system in order to stabilize the property tax over time and to reduce intertown inequities in tax burdens. The large amount of data and tables, on which this discussion is based, cannot be presented due to limitations of space.

Responsibility for local government in Connecticut, including education, rests with 169 towns. Their jurisdictions cover the state's area and encompass incorporated villages, boroughs, school districts, and other population centers. Towns are small in area, averaging about 16,000 acres, and range in population from a few hundred to about 180,000.

The most important source of town revenue is the local property tax. This tax is administered locally pursuant to general statutory regulations applicable to all towns, and rates differ widely among towns. This source is supplemented by a rather complex grant system and by other minor local revenues. In 1952 the property tax provided an average of 79 per cent of local government revenues excluding new borrowings, and state grants accounted for an average of about 11 per cent. The proportion covered by state grants varied widely, however, from about 58 per cent in the smallest towns to about 8 per cent in Hartford, the largest city. This range reflected the sliding-scale formulas favoring small towns that dominate the state grant system.

The property tax, at best an imperfect instrument of public finance, has faced increasing strains in Connecticut in recent years. Population growth, rising standards of living in public services, and inflation, combined with relatively rigid grant formulas, have caused marked increases

* This paper abstracts from a dissertation now in preparation in partial fulfillment of the requirements for a Ph.D. degree. The author gratefully acknowledges the advice and leadership of Dr. Harold G. Halcrow, her adviser.

in local tax requirements. Property values in many towns, on the other hand, have grown more slowly.

Some tendency has also appeared for intertown differences in tax burdens to widen, a factor that may be related to the rapid trend towards suburbanization. Towns that were once economic entities, where people lived and worked and traded, are now increasingly specialized as residential, or commercial, or industrial. The property tax, once levied on relatively balanced and diversified economic microcosms, must now rely on somewhat more specialized aggregations of property. Where this specialization has led to concentration of residential properties having, for political or economic reasons, a low revenue potential in relation to the costs of necessary supporting services, a particularly severe revenue problem exists. Many towns try to meet this problem by forcing diversification of the tax base through zoning against residential development. Such zoning devices, if effective, limit the suburban movement of the poor from the cities, place mounting pressure on old, inferior urban housing, and are clearly contrary to the welfare of the state and its citizens.

The past few years have seen mounting interest in local finance. For the most part, this interest has been focussed on the problems of financing individual functions of town government, particularly education and highways. This functional approach has also characterized some examinations of the broad problem of state-local fiscal relations.[1] Another emphasis has been case studies of the fiscal problems of individual towns.[2]

The study that this paper summarizes, supplements the functional and case-study approaches with an assessment of the total impact of financing town government on town development and economic problems, and the relation of town development to a balanced economy for the state as a whole. In this study education and highway development were taken as data rather than as objectives, and the individual towns were considered in relation to the community of towns that make up the state. The end product of the paper is a set of recommendations for revising the present grant system.

Because a political recommendation is of little immediate use if it is politically unacceptable, this analysis works within certain rather obvious

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[1] Much of the work of the Connecticut State Departments of Education, Highways, etc., falls into this category, as do many publications of the Connecticut Public Expenditure Council. See also studies such as *The School Tax Crisis in Connecticut*, by Harold G. Halcrow and Dorothy C. Goodwin (Storrs Agricultural Experiment Station Bulletin 316, February 1955), and *State and Local Governmental Relationships in Connecticut*, by the [MacDonald] Commission to Investigate the Relationship Between the State and its Subdivisions (December 30, 1954).

[2] See Beldon H. Shaffer's *Small Homes and Community Growth*, and *Growing Suburbs and Town Finance* (Institute of Public Service, University of Connecticut), September and November, 1954.

limitations. It starts with the present structure of local government and state-local relations, and assumes that institutional changes must not jeopardize local autonomy, or the town as the functioning unit of local government. It also assumes that the local property tax will remain the bulwark of local finance. The scope of the recommendations was further narrowed by two general guiding sets of criteria. These were:

(1) Revisions in the present method of financing local functions should provide incentive rather than penalties for good management at the local level, should be as neutral as possible in their impact on location of industrial or residential development within the state, and should avoid penalizing towns for unique advantages derived from location, natural resources, or wisdom in the past in management of their affairs.

(2) The local finance system should emphasize a balanced economy and a diversified tax base for the state as a whole rather than for each individual town. A tax system that permits specialization by towns in industry or residential facilities if other factors in the economy are conducive to such specialization, may improve the comfort and efficiency of the state's citizens. The present growing stress on diversification of the tax base in each town is the result of too heavy a load on the property tax.

The analysis from which the recommendations were derived was based on detailed study of the town accounts for the 29 towns of Hartford County for 1952, with comparisons with 1942, as they appeared in publications of the State Tax Commissioner.[3] Per capita and per cent computations were used for intertown comparisons.

A non-random sample of politically related, contiguous towns was used to enable study of the towns in relation to one another, and to focus attention on the economic and social interdependence of neighboring towns in Connecticut. Because such a sample does not permit use of statistical techniques requiring assumptions of randomness, the analysis is based on array and inspection of the data. This method throws into relief many details that would be obscured by aggregative methods, and it permits a wider range of insights into the problems studied. A large measure of intuition and subjectivity is inevitable, however.

A further limitation arises from concentration on data for one fiscal year, with very limited comparisons with earlier years. Continuous trend data are for all practical purposes unavailable for so large a sample as 29 towns, however, because the basic report appears quadrennially only. The

[3] *Quadrennial Report of Indebtedness, Receipts and Expenditures of Municipalities, 1952*, State of Connecticut, Public Document No. 22, Taxation Document No. 327, Hartford 1954 and quadrennially; *Information Relative to the Assessment and Collection of Taxes, 1952*, State of Connecticut, Public Document No. 48, Taxation Document No. 326, Hartford 1953, and annually; and unpublished municipal audit reports on each town, from the files of the State Tax Commissioner's Office.

study is, therefore, exploratory rather than definitive, suggestive rather than conclusive.

The data were used to study intertown differences in the ratio between revenue needs for services required and fiscal capacity to meet these needs. The resulting array of cost/capacity ratios was then compared with the aggregate amounts of per capita state grants for all purposes allocated to each town in 1952, to determine the pertinence of the existing grant formulas to actual need.

For purposes of these comparisons need was defined in terms of expenditures for services rendered in 1952, and then modified by reference to outstanding indebtedness, and to data for 1940 or 1942. This identification of need with actual expenditures involves some rather heroic assumptions about the adequacy of existing services, their comparability among towns, the efficiency with which funds are handled, and the insensitivity of budgets to availability of funds, but it is the only objective measure of need available.

The measure of capacity, necessarily based on the value of taxable property, is also imperfect. Property tax assessments in Connecticut are subject to the same sorts of error as assessments anywhere else. In view of the absence of effective intertown equalization of assessment levels by the state, intertown differences in assessments are perhaps somewhat greater than in states where equalization is attempted. Reported grand list valuations are, therefore, virtually worthless for purposes of intertown comparisons. A possibly better guess can be derived from the estimates submitted to the Tax Commissioner by the assessor for each town of the per cent of actual market value represented by assessments in his town. These admittedly very rough measures were used as indices of capacity. They also were considered in relation to the town's debt position, and to changes since 1940 or 1942.

Time does not permit a detailed presentation of the statistical evidence underlying conclusions regarding differences in cost/capacity ratios. The analysis of town accounts suggests, however, that the central rationale of most current state grants, the assumed poverty of small towns, is not valid. The tax capacity of small towns is low, but the cost of the limited services they need is even lower. Per capita expenditures tend to increase rather than decrease with size, and tend to increase faster than per capita corrected assessments. They also vary with the composition of the property base, the degree of urban congestion, and the rate of population growth. The largest per capita expenditures occur in the largest cities and in the fastest-growing primarily-residential towns, the smallest in minor urban centers not yet under the major impact of the residential-town trend. Large grants obscure the position of farming towns. These offer

simpler services than larger towns, but may have some higher per unit costs. Aggregate per capita needs appear less than in larger towns.

High revenue capacity is associated to some extent with low costs, and low capacity with high costs. This tendency is not uniform, partly because of differences in natural advantage or management practices. Where it exists it may indicate that high costs depress financial capacity by limiting introduction of industrial and commercial establishments, or that low capacity is associated with a property base requiring expensive services, or both.

A revised grant program is proposed with two major objectives, to stabilize town property tax burdens in the face of increasing revenue needs, and to incline them towards greater equality among towns.

The most obvious way to correct present inequities in the tax and grant system would be to measure revenue capacity directly through the grand list, and revenue need directly through the grand levy, and distribute grants so as to equalize mill rates. Such an approach would demand, as the minimum requirement of equity, that assessments be uniform and reflect equal proportions of "true" market value.

The problem of uniform assessment practices has nowhere been satisfactorily solved.[4] If it could be solved it surely would have been solved by now. The property tax has been with us for a long time. Many attempts have been made to improve it, but it does not seem to get much better. The difficulty lies, not so much in inadequate expertness in assessments, or carelessness or corruption on the part of assessors, as in the fact that no amount of care, expertness or honesty will make the market value of property not for sale an objective estimate. Values are inevitably subjective. Any rule-of-thumb measure, such as replacement costs, front footage, number of cubic feet, etc., will inevitably be weighed by the assessor against his judgment of the importance of imponderables such as location, style, and guesses of future trends of town development. As long as the measure must include a large subjective element it is inevitably subject to manipulation.

This does not mean that the property tax should be forthwith abolished. We cannot do without it at the present time. Nor does it argue that efforts should not be made to improve it. They must be made, in the interests of good government, justice and sound economics. But it does mean that grand lists should not be used as a basis for grant distribution. Equalization grants distributed so as to favor towns with low grand lists will produce low grand lists. The difficulties in equalizing the impact of the property tax seem to be inherent in the tax itself. To face this fact

[4] See Roger A. Freeman, "The Property Tax: Bulwark of Local Government," *Tennessee Town and City, Technical Section*, February 1956, pp. 13-18.

in devising grant distribution systems would seem to be the part of wisdom. A way must be found to reduce present intertown inequities without further deliberately complicating administration of the property tax.

If direct equalization of mill rates must be rejected as administratively unfeasible and inseparable from undesirable side effects, some other criterion of equalization must be substituted. An indirect approach, approximate rather than precise in effect, and as neutral as possible in economic impact, is, therefore, suggested.

In constructing a revised grant program along such lines, use of a number of complementary channels will provide the greatest flexibility and at the same time minimize the problem of complex formulas whose implications and rationale cannot be readily grasped. The suggested grant channels are of two major types. The most important relates directly to units of service performed. Grants of this sort would be made at the same or nearly the same rate for all towns for services whose total costs tend to vary directly with the number of units of service provided. Such grants would be directed primarily at stabilization of tax burden over time, and would include per pupil grants for operating costs of education, per mile grants for highways, and aids for welfare and other minor services.

The second type of grant channel would compensate specifically for identified sources of divergence from a central tendency of constant economies of scale, or revenue capacity directly proportionate to size, that are general in character, i.e., not derived from differences in natural advantage or local idiosyncracies. These grants would relate to the problem of intertown inequalities in tax burden. No attempt would be made to equalize the effects of natural or historical advantage through a grant system, or the result m ght be to penalize past history of good luck or good management. On the basis of material reported in this study, grants of this sort would relate to the three factors previously identified as associated with high costs and/or lo v capacity. These are: predominance of the residential function, urban congestion, and a rapid rate of population growth. The first two relate to current expenditure needs, the third to the problem of financing capital additions to public facilities.

To insure that payments in these three fields are automatically responsive to changes in residential patterns, urban congestion, and growth, as well as predictable beyond one year's budget, they must be tied to general statistical indices of growth and change rather than to specific outlays.

For the residential grant a possible index might be the proportion of residential property in the total tax base. Within a state-wide ceiling for

aggregate residential grants, funds could be prorated to individual towns on the basis of the following formula: per cent of value of local grand list in residential buildings multiplied by population. Such a grant, with or without additional refinements, would tend to relieve the pressure now felt towards forced diversification of town tax bases, and would reduce barriers to residential development outside of older urban areas. The optimum level for this grant must be figured very carefully, however, for by easing the financing of services for residential areas the grant might encourage zoning against industrial development.

A simple and comprehensible device for allocation of a grant to compensate for the high costs of urban congestion would be to prorate a given total sum of money among towns by multiplying population density per acre or per square mile in each town by total population for the town.

A capital grant computed in relation to growth could be allocated by prorating a given total sum of money by multiplying the per cent increase in population over a stated period by the actual numerical increase. Such a grant could be used annually to pay current debt-retirement costs, or it could be deposited by the town against future specific construction needs.

Capital grants of this type would presumably be available for any recognized capital purpose, and could be financed from current state revenues. Such a grant system would have obvious advantages in planning and budgeting at both the town and the state level over the present *ad hoc* emergency grants for school construction; and would have no particular undesirable side effects or disadvantages in comparison with the present system except that, under it, the amount of funds now granted in a given year would be spread so thin that an increase in the total grant level would be required if the fiscal effect were to be appreciable.

To insure a reasonably stable element of predictability in these three grants, the allocation for a given year could be based on data for at least a year earlier. Or the grants could be held stable for five or ten years and readjusted only to fit the data of new census or other surveys.

This approach to the grant problem involves partial abandonment of the principle of earmarked grants. Unless a grant is larger than the total requirement in a given field, however, the earmarking device does not guarantee an increase in expenditures for the specified purpose. The same effect as earmarking can be achieved by statutory requirements for minimum expenditures in given fields.

Tests at four hypothetical appropriation levels of the equalizing power of this proposal suggest that some improvement over the present system is possible even with no added funds, and that larger appropriations

would increase the improvement. Application of this system at any level of appropriations would shift the comparative position of towns, moving the now-favored farming towns to somewhat more average positions. This shifting might be reduced by reintroduction of a modified sliding scale for per unit grants.

The basic formulas for the grants as proposed are easy to calculate and to understand, predictable enough to permit efficient budgeting, and automatically self-adjusting to changes in the particular patterns to which they relate. They may be refined and modified in many ways without vitiating the central principles on which they rest, but most modifications would involve some increase in complexity.

ESTIMATING DEMAND FOR LIVESTOCK PRODUCTS AT THE FARM LEVEL*

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THIS paper is a discussion of an analysis of the farm demand for livestock products. The results of earlier studies are not wholly satisfactory for a variety of reasons. Some analyses, such as that of Hildreth and Jarrett, are on too high a level of aggregation to be useful.[1] Some other studies that group the products at the desired level of aggregation deal with demand at retail. The work of Fox, reported in USDA Technical Bulletin No. 1081, includes the parameters of interest, but is restricted to the interwar years.[2] A sufficient number of years have now passed since the war to make possible an analysis using both prewar and postwar data. Such an analysis is preferred provided the accompanying problems related to price level, trends, etc., can be overcome.

The Deflation Problem

Any price analysis that includes time series data involves the problem of how to deal with the general level of prices. In many studies this difficulty is handled by deflating the price and income series with an indicator of the price level such as the consumer price index (CPI). This procedure may be as satisfactory as any other when working with retail demand. However, deflation with the CPI may lead to erroneous results when employed in an analysis where two or more degrees of price variation are involved. The fact that farm prices tend to fluctuate more than retail prices requires that a farm price be deflated by a flexible series such as the index of prices received by farmers for all commodities. A difficulty arises when such a deflated price is related to real income. The income coefficient obtained depends not only on the income elasticity of the given commodity, but also on the income elasticity for all farm commodities. For example, if the income elasticity for all farm commodities is greater than for the commodity in question, a negative income coefficient will appear in the estimates.[3]

Perhaps these difficulties can be overcome by a model that accounts explicitly for changes in all prices by judicious selection of the variables that enter the model. Such is the type of model to be presented here.

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* This paper is based on research still in progress. Subsequent findings may alter some of the conclusions.

[1] Clifford Hildreth and F. G. Jarrett, *A Statistical Study of Livestock Production and Marketing* (Cowles Commission Monograph 15, New York: John Wiley and Sons, Inc., 1955).

[2] Karl A. Fox, *The Analysis of Demand for Farm Products*, Bureau of Agricultural Economics, United States Department of Agriculture, Technical Bulletin 1081 (Washington: Government Printing Office, 1953).

[3] The proof of this statement is too involved to develop here. In some preliminary work where the deflation procedure described above was followed, the income coefficients for three of five commodities had negative values.

The Economic Model

The concept of farm demand to be formulated in this section is used primarily as a guide in the development of a stochastic estimating model and to assist in making a correct interpretation of the results of that model. This formulation is not stochastic and, for simplicity, is stated completely in terms of linear equations.

The model is developed in terms of a commodity (x) which is perishable and has a single end use, domestic consumption. Thus, demands for storage, export, etc., are not considered, and the quantity variable for the farm level demand is identical with that at retail.

The derivation of the farm demand relation is expressed by the following equations:

$$(1)\quad P_x^r = a + bQ_x + \sum_{i=1}^{n} c_i S_i + dI + eY \qquad \text{Retail demand equation}$$

$$(2)\quad P_x^f = P_x^r - M_x \qquad \text{Farm-retail price identity}$$

$$(3)\quad M_x = g + hQ_x + jI \qquad \text{Marketing margin relation}$$

$$(4)\quad P_x^f = (a - g) + (b - h)Q_x + \sum_{i=1}^{n} c_i S_i + (d - j)I + eY \qquad \text{Farm demand equation}$$

Where: P_x^r = retail price of x
Q_x = per capita consumption of x
S_i = retail price of a commodity i which is a close substitute for x; there are n such commodities
I = the retail non-food price index; represents all goods and services other than food
Y = per capita disposable personal income
P_x^f = farm price of x
M_x = the marketing margin for x

The first equation is the basic retail demand function expressing the price of a commodity as a linear function of the quantity of the commodity, the prices of all other commodities, and disposable personal income.[4] In order to allow for changes in population, consumption and income are expressed on a per capita basis.

All other commodities are divided into two categories. For commodities which may be considered to be close substitutes for the commodity under study the prices are included individually. The prices of the remaining commodities are grouped into a single index. The selection of the index used will be discussed later.

[4] Price is placed on the left of the equality to facilitate the derivation. At this point no connotation of dependence or independence in the regression sense is intended.

The second equation is a simple identity stating that the farm price is equal to the retail price less the marketing margin.

The third equation is an expression of the relationships among the marketing margin, the quantity marketed, and the costs of performing marketing services. The quantity effect on margins results from the tendency of merchants to maintain constant percentage markups. Thus, if quantity increases, the absolute marketing margin will fall with the accompanying decline in price, and vice versa.

The costs of marketing are affected mostly by changes in the prices of factors used in marketing and the efficiency with which they are used. The index of non-food prices at retail reflects the general level of costs in industry at large and probably is the best indicator of changes in marketing costs. In any case, the marketing margin and this index are highly correlated. A simple correlation between the nonfood price index and the marketing margin for the AMS "Farm-food Market Basket" for the period used in the study gave an r^2 of .98.

If (x) were one of the livestock products listed earlier the close substitutes might be the other livestock commodities. Then the ideal index for all other prices in equation (1) would be the index of prices of all goods and services other than livestock products. Because of the high correlation between this index and the index of non-food prices, both indexes could not be included in the same estimating equation with any hope of obtaining meaningful coefficients. Using the non-food price index in both equations (1) and (3) closely approximates the ideal situation and simplifies equation (4).

The Statistical Model

The farm demand equation is linear in actual values of the variables. Although theory gives little justification for any particular mathematical formulation of a demand function, probably the relationships are more stable in percentage terms than in terms of actual values. Thus, an equation where the values of all variables are expressed in logarithms would be preferable to (4). If the assumption of greater stability in percentage terms is correct, the use of logarithms would be especially important in an analysis where prewar and postwar data are combined. The use of logarithms has the further advantage that when the equation is normalized with respect to the quantity coefficient the remaining coefficients usually are directly interpretable as elasticities.[5]

With five commodities, at least five equations must be considered. Under the assumption that the five commodities substitute for each other, there are at least five jointly determined variables in each equation. Thus, simul-

[5] The use of logarithms in the estimating equations is not precisely consistent with the model developed in the previous section. However, equation (4) is too complex for estimation purposes when the model is developed from a logarithmic retail demand equation.

taneous techniques are required. The estimation procedure to use depends, of course, upon the degree of identification present in the equations.

Changes in prices of livestock products have so slight an effect on disposable personal income that little bias would be expected if Y were treated as a predetermined variable. Similarly, the index of nonfood prices was considered a predetermined variable.

In the very short run, producers may speed up or hold off marketing in response to changes in prices. Also, in the longer run of more than one year, changes in production may be made as a result of variation in price ratios. In an annual marketing period, however, it is doubtful that significant response in marketings of most livestock products can be made. Undoubtedly, this condition does not hold so well for broilers, and possibly for eggs, as for other commodities. Nevertheless, quantity was considered predetermined for all commodities.

With endogenous variables represented by y's and predetermined variables by z's, the system whose parameters are to be estimated is:

$$y_1 + b_{12}y_2 + b_{13}y_3 + b_{14}y_4 + b_{15}y_5 + c_{11}z_1 + c_{16}z_6 + c_{17}z_7 + c_{10} = u_1$$

$$b_{21}y_1 + y_2 + b_{23}y_3 + b_{24}y_4 + b_{25}y_5 + c_{22}z_2 + c_{26}z_6 + c_{27}z_7 + c_{20} = u_2$$

$$b_{31}y_1 + b_{32}y_2 + y_3 + b_{34}y_4 + b_{35}y_5 + c_{33}z_3 + c_{36}z_6 + c_{37}x_7 + c_{30} = u_3$$

$$b_{41}y_1 + b_{42}y_2 + b_{43}y_3 + y_4 + b_{45}y_5 + c_{44}z_4 + c_{46}z_6 + c_{47}z_7 + c_{40} = u_4$$

$$b_{51}y_1 + b_{52}y_2 + b_{53}y_3 + b_{54}y_4 + y_5 + c_{55}z_5 + c_{56}z_6 + c_{57}z_7 + c_{50} = u_5$$

Where: y_i $(i=1, 2, \cdots, 5)$ = price received by farmers for i
z_i $(i=1, 2, \cdots, 5)$ = per capita consumption of i
z_6 = per capita disposable personal income
z_7 = index of retail non-food prices
μ_i = unobserved disturbance in demand equation for i
i = 1—beef
2—pork
3—poultry
4—eggs
5—dairy products

The system contains five endogenous variables and seven predetermined variables. Each equation contains five endogenous and three predetermined variables. Thus, if the assumptions followed in classifying the variables are correct, the necessary condition for just-identified equations is satisfied by each equation in the system.

Results for the Simultaneous Equations Model

Estimates for the b's and c's in the above model were made with the use of data for the years 1924–54, exclusive of the war years 1942–46. First differences of the logarithms were used in the calculations because of trends

in the data and because of the large differences in the levels of the prewar and postwar values of some of the variables. As a result, the model refers to short-run relationships only.

The results, with standard errors listed in parentheses are:

$$y_1 = -.039y_2 + .037y_3 + .151y_4 - .025y_5 - 1.344z_1 + 1.731z_6 - 1.883z_7 - .003$$
$$(.122)\quad (.278)\quad (.274)\quad (.369)\quad (.189)\quad (.538)\quad (.809)$$

$$y_2 = .106y_1 - .479y_3 - .302y_4 + 1.078y_5 - 2.339z_2 + 1.419z_6 - 1.176z_7 - .021$$
$$(.250)\quad (.509)\quad (.519)\quad (.734)\quad (.492)\quad (.757)\quad (1.330)$$

$$y_3 = .148y_1 + .130y_2 - .029y_4 + .309y_5 - 1.255z_3 + .361z_6 + .637z_7 - .002$$
$$(.086)\quad (.080)\quad (.173)\quad (.239)\quad (.220)\quad (.284)\quad (.479)$$

$$y_4 = .123y_1 - .006y_2 + .697y_3 + .198y_5 - 2.751z_4 - .055z_6 + 1.143z_7 - .004$$
$$(.187)\quad (.157)\quad (.300)\quad (.448)\quad (.952)\quad (.590)\quad (.976)$$

$$y_5 = .133y_1 + .024y_2 + .143y_3 - .300y_4 - 3.342z_5 + 1.126z_6 - 1.303z_7 - .015$$
$$(.098)\quad (.092)\quad (.214)\quad (.245)\quad (.916)\quad (.279)\quad (.604)$$

The coefficients may be converted to elasticities by interchanging the price and quantity variables and dividing by the quantity coefficient in each equation. This gives precisely the same results as would be obtained if all equations were treated simultaneously by the use of matrix operations.

Although tests of significance have not been developed, the size of the coefficients relative to their standard errors should give some indication of their reliability. In all equations, the quantity coefficient (the coefficient of price flexibility) is greater than twice its standard error. In only one instance, b_{43}, is a coefficient of the price of a substitute commodity greater than twice its standard error. Seven of these price coefficients, one income coefficient, and two price index coefficients have signs that are incompatible with theory.

The failure to achieve reliable coefficients for the substitute price variables may be due to many causes. The individual cross-elasticities are undoubtedly small. Due to the high correlation among the price variables it may be impossible to measure these small relationships. It is unlikely that these results are due to the manner of handling the deflation problem, however, for similar results were obtained in other models where different deflation procedures, including conventional methods, were employed.

A Revised Statistical Model

In a revision of the model, no attempt was made to account for substitute commodities individually. The four substitute variables were replaced by

the index of consumption of all livestock products except the commodity being considered. Under the assumptions made earlier, this is a predetermined variable. Therefore, each equation has but one endogenous variable. The estimation procedure reduces to performing five least squares computations. The use of quantities rather than prices of substitutes was also prompted by the fact that in practical application one is interested more often in situations where the quantities of substitutes are given than where prices are given.

First differences of logarithms for the same time period as in the original model were used in the revised model. The results are:

$$y_1 = -1.370z_1 + 1.825z_6 - 1.831z_7 - .445z_{91} - .005 \qquad R^2 = .87$$
$$\quad\ (.154)\quad (.212)\quad (.664)\quad (.552)$$

$$y_2 = -1.829z_2 + 2.021z_6 - 1.734z_7 - .211z_{92} - .019 \qquad R^2 = .83$$
$$\quad\ (.282)\quad (.374)\quad (1.105)\quad (.911)$$

$$y_3 = -1.164z_3 + 1.275z_6 - .135z_7 - 1.160z_{93} - .009 \qquad R^2 = .86$$
$$\quad\ (.214)\quad (.168)\quad (.532)\quad (.392)$$

$$y_4 = -2.433z_4 + 1.291z_6 + .252z_7 - 1.917z_{94} - .017 \qquad R^2 = .62$$
$$\quad\ (.879)\quad (.322)\quad (1.122)\quad (.724)$$

$$y_5 = -2.600z_5 + 1.168z_6 - 1.119z_7 - .132z_{95} - .013 \qquad R^2 = .82$$
$$\quad\ (.631)\quad (.157)\quad (.524)\quad (.269)$$

Where z_{9i} is the per capita consumption of all livestock products other than i, and all other variables are as defined earlier.[6]

In the revised model only one coefficient, the price index coefficient in the poultry equation, has a sign contrary to theoretical expectations, and this coefficient is extremely small relative to its standard error. The estimates of the price elasticities of demand for this model are: beef, −.73; pork, −.55; poultry, −.86; eggs, −.41; and dairy products, −.38. The order of the commodities, with poultry most elastic and eggs and dairy products least elastic, is consistent with expectations based on *a priori* reasoning and the results of other studies. The actual values of the elasticities also appear to be reasonable.

The actual and calculated first differences of logarithms of prices for this model are shown in Figure 1. In general, differences between the two values are quite small. The positive difference between the actual and calculated

[6] The recently revised estimates for per capita egg consumption for 1951–54 were used in the computations but the corresponding revisions for poultry were not available when the computations were made. Possibly these revisions will change the results somewhat.

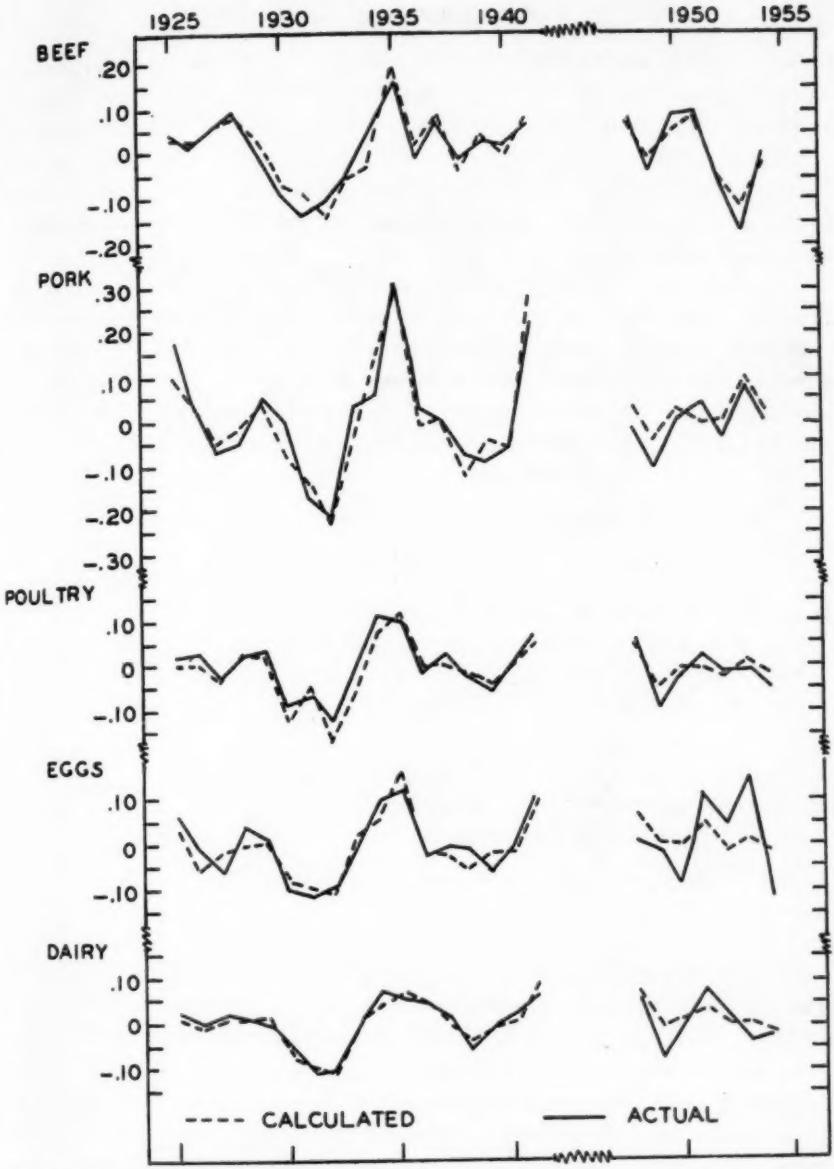

FIG. 1. PRICES RECEIVED BY FARMERS FOR LIVESTOCK PRODUCTS: FIRST DIFFERENCES OF LOGARITHMS, ACTUAL AND CALCULATED FROM LEAST-SQUARES MODEL, 1925—41 AND 1948—54.

values in 1951 for all commodities is probably due to economic factors resulting from the Korean conflict.

At the five per cent probability level the Durbin-Watson test failed to reject the hypothesis of serial independence in the residuals for all the equations except that for eggs. For the egg equation the test was inconclusive.

Interpretation of Results

The quantity coefficient is the one most closely interpretable as a conventional demand parameter. The parameter is, of course, the coefficient of price flexibility and is the reciprocal of the price elasticity. It should be emphasized, however, that the concept of farm elasticity differs from retail elasticity by other than the relative value of the price component. The farm level elasticity also includes a factor resulting from the effect of quantity on marketing margins.

The estimated price elasticity is also influenced by the fact that the quantities of substitute commodities, rather than their prices, were held constant. Working states, without proof, "If prices of other meats are held constant, the elasticity of demand is somewhat greater than if supplies are held constant."[7] A demonstration of this can be made with the use of a simple two-equation system.

The structural equations are:

$$P_x + b_{12}P_0 + c_{11}Y + c_{12}I + c_{13}Q_x + c_{10} = u_1$$

$$b_{12}P_x + \quad P_0 + c_{21}Y + c_{22}I + c_{23}Q + c_{20} = u_2$$

Where P_x = the price of a commodity (x)
P_0 = the composite price of competing commodities
Q_x = the quantity of x
Q_0 = the total quantity of competing commodities
Y = consumer income
I = the index of prices of all other goods and services
All variables are expressed in logarithms.

The reduced form of the system is:

$$P_x = p_{11}Y + p_{12}I + p_{13}Q_x + p_{14}Q_0 + a_1 + v_1$$

$$P_0 = p_{21}Y + p_{22}I + p_{23}Q_x + p_{24}Q_0 + a_2 + v_2$$

p_{13} is the reciprocal of the desired price elasticity when the total quantity of competing commodities is held constant and $-c_{13}$ is the reciprocal of this elasticity when the price is held constant. In the transition from the reduced form to the structural equations, $-c_{13} = p_{13} + b_{12}p_{23}$. Since p_{13}, b_{12}, and p_{23} all have negative values, the absolute value of c_{13} is smaller than p_{13} by the amount $b_{12}p_{23}$. Therefore, the elasticity with price constant, $1/-c_{13}$, is greater than the elasticity with quantity constant, $1/p_{13}$.

The income coefficient with price dependent is similarly affected. This coefficient, and in most cases the income elasticity, is greater when quantity of substitutes is held constant than when prices of these commodities are held constant. In the above system $-c_{11}/c_{13}$ is the conventional income elas-

[7] Elmer J. Working, *Demand for Meat*, Institute of Meat Packing (Chicago, The University of Chicago Press, 1954), p. 69.

ticity with *prices* of competing commodities held constant. $-p_{11}/p_{13}$ is the income elasticity with the *quantity* of competing commodities held constant. The relationship between c_{11} and p_{11} is $-c_{11}=p_{11}+b_{12}p_{21}$. If the commodities are superior goods, p_{11} and p_{21} are positive. b_{12} is negative and, therefore, the absolute value of c_{11} is less than p_{11}. If the proportional difference between p_{11} and c_{11} is greater than that between p_{13} and c_{13}, the income elasticity with consumption held constant will be the greater. Ultimately this reduces to showing that $p_{21}/p_{11}>p_{23}/p_{13}$. Since p_{23} states the effect of quantity of the given commodity on the composite price of substitutes, in general it would be expected to be a very small value and the inequality would hold.[8]

Aside from the condition mentioned above, the income coefficient may be unstable due to the high correlation between income and the nonfood price index.

The coefficients for the nonfood price index and the quantities of other livestock products have no precise economic interpretation. The coefficient for the nonfood price index contains a factor resulting from the marketing margin relationship. The other component of this coefficient should be close in value and opposite in sign to the income coefficient since a change in the nonfood price index is closely equivalent to a change in real income in the opposite direction. The coefficient for z_{91} is an indication of the degree of substitutability of the given commodity with all other livestock products, but it is not a cross elasticity.

The results of the revised model are considered satisfactory within the limitations that exist for any such analysis. The price elasticities, which are the estimates of primary interest, appear reasonable in terms of values and in the way they are ordered. Most of the calculated residuals are small in both the prewar and postwar periods. The Durbin-Watson test was inconclusive for the egg equation, but in all other cases it did not reject the hypothesis of serial independence.

[8] A system similar to the one above was estimated for beef. The resulting values were: $p_{11}=-1.37$, $c_{13}=-1.32$, $p_{11}=1.82$, and $-c_{11}=1.52$. Although the differences among the coefficients of price flexibility were small the income coefficient when the quantities of substitutes were held constant was considerably larger than when prices were held constant.

ECONOMIC CONSIDERATIONS IN THE DESIGN AND EVALUATION OF PRODUCTION FORECASTS[1]

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1. *Introduction*

THE normative phase of economic theory is engaged in developing prescriptions for optimum action on the part of a rational economic unit. The decision maker (the economic unit), who is faced with the problem of selecting one action out of a set of all possible relevant actions, is assumed to have perfect knowledge of the magnitude of the variables considered in making the selection. The limitation of this assumption is realized as soon as one tries to apply the results in guiding the activity of an economic unit. In fact, the descriptive economist would blame much of the discrepancy between optimum and observed actual behavior on the fact that the information assumed in arriving at the prescription for optimum behavior was not actually available to the decision maker. (1) How can the economist guide the decision maker in collecting his information? (2) In view of the fact that knowledge is imperfect, should the prescription for optimum action be changed? And if yes, how?

This paper attempts to answer these two questions largely in the case where the required information is that of the magnitude of a forthcoming production of a crop. Knowledge of what is available to be marketed is essential for the operation of many of the marketing programs in agriculture that utilize extensively forecasts of production. In general, production forecasts are used in making decisions in regard to price. For lack of space, only one aspect of the problem of price formation, that of allocating production to several markets, is considered. The markets can be defined by space, time, form of the product, or by other criteria.

2. *Further Statements of the Problem and the Approach to Its Solution*

The main idea underlying the paper is that the design of the forecast and the choice of the appropriate action should be guided by their consequences. This idea, applied to all statistical decisions, is due to Wald.[2]

A forecast is important in so far as it provides a basis for making a decision, and thus the trivial case where the decision is invariant under the

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[1] Giannini Foundation Paper No. 157. This paper is a condensation of a part of a chapter with the same title in a doctoral dissertation on production forecasts. Limitations of space made it impossible to reproduce the algebraic proofs justifying some of the statements made in this paper.

The author is indebted to Professor G. M. Kuznets who was very generous with his time and ideas at the various stages of preparing this manuscript, including the elimination of many lapses in style. Stylistic assistance was also given by Mr. John Mamer.

[2] Abraham Wald, *Statistical Decision Functions* (New York: John Wiley and Sons, Inc., 1950).

forecast is ruled out. The decision is made to maximize the value of a function (in our case, the revenue function) under the given state of knowledge. The function is defined over the domain of the decision space (the set of all relevant actions). As a result of the dependence of the decision on the state of knowledge, the action taken on the basis of the forecast is likely to differ from the one that would have been obtained if the actual outcome (production) were known. This discrepancy is the loss that can also be expressed as

$$L(q, Q) = R(Q, Q) - R(q, Q) \tag{1}$$

where $L(q, Q)$ is the realized loss when the available information (the forecast) is q and the actual outcome (production) is Q. It is equal to the difference between the value of the function (revenue), R, when the available knowledge is perfect and its value when the available knowledge is q and the outcome is Q. Thus, the loss function represents the consequences of the forecast.

The loss is a random variable and hence we can only control its distribution. This will be done by designing the forecast in such a way that the risk, defined as the expected value of the loss function, is minimized. The criterion of minimum risk is not unique. Instead, one could choose to control the fluctuations of the loss function by minimizing its second moment. Another alternative is the minimax criterion according to which the optimum forecast is the one that minimizes the maximum loss that could be sustained. Minimizing the risk is probably the most desirable criterion if long-run considerations are paramount.

Three aspects of the design of the forecast are considered. In general, any forecast is based on measurement of characteristics of the crop that are related to production. This measurement yields a sample statistic. The first aspect is that of finding a function of the sample statistic that will give an optimum forecast (that is, minimize the risk). The second is to determine the size of the sample and thereby the cost of experimentation. The third is to extend the criterion to facilitate the selection of the optimum method of forecasting.

The selection of the optimum forecast for a given sample statistic is handled within the framework of obtaining Bayes estimates.[3] The latter is described as follows: Let Q be a random variable whose value on the ith experiment we want to forecast. The marginal (or a priori) distribution is known and noted by $f(Q)$. In order to forecast Q, n observations are made on a random variable x, and a sample statistic, t, is computed. That is, t maps x into the forecast space. Further, t and Q have a known joint probability

[3] David Blackwell, and M. A. Girshick, *Theory of Games and Statistical Decisions* (New York: John Wiley and Sons, Inc., 1954), Sec. 11.2.

distribution, $g(Q, t)$. We are also given a function, $L(Q, t)$, indicating the loss when t is the forecast and Q is the true outcome. By the criterion of minimum risk, q_0 is the optimum forecast, if, and only if, for all i

$$\int f(Q)L(Q, q_0) \leqq \int f(Q)L(Q, q_i) \tag{2}$$

That is, q_0 has to minimize the risk, evaluated over the a priori distribution. The solution is obtained by computing the a posteriori distribution, $h(Q|t)$, and the optimum forecast is that number q_0 which minimizes the a posteriori risk. That is,

$$q_0 = \min_q \int L(Q, q)h(Q|t) \tag{3}$$

The determination of the optimum sample size, cost of experimentation, and the selection of the method of forecasting will be discussed in reference to a particular example.

Subsequent discussion will only deal with the problem of forecasting production for the purpose of making allocation decisions.

3. The Loss Function for Two-Market Allocation— The Demand Function Is Unspecified

The assumptions are: (1) The decision maker has monopolistic power and his objective is to maximize his gross revenue. (2) The range of his decision is the allocation of the total production between two independent markets. (3) The demand function is unspecified but restricted to be a decreasing function. The discussion is limited to the case where the demand equation is free of disturbances. The inclusion of disturbances in the demand equation does not affect the design of the forecast because forecast errors and demand disturbances are likely to be independently distributed. (4) The allocation is done as follows: At the planning stage, the ex ante allocation is made whereby q_a^* and q_b^* are the quantities assigned to markets A and B, respectively, so that

$$R = R_a + R_b \text{ is maximized and } q_a^* + q_b^* = q,$$

where R is gross revenue. The ex post allocation is the pair of quantities $q_a + q_b = Q_b$ where Q is the true production. At this stage market A has priority and, hence, the ex post allocation is defined to be $q_a - q_a^*$ if $Q \geqq q_a^*$ and $q_a = Q$ otherwise. Accordingly, we have $q_b = Q - q_a$ or $q_b = 0$. Finally, there exists a pair $Q_a + Q_b = Q$ that gives max. $R_a + R_b$.

Let the demand be $y_i = f_i(x_i)$, $y = P, p$, $(i = a, b)$ for $x = Q, q$, respectively. Then utilizing (1)

$$L(Q, q) = P_aQ_a + P_bQ_b - (p_aq_a + p_bq_b). \tag{4}$$

The effect of the forecast on L is evaluated by taking the derivative of L with respect to q. If we assume that $Q \geqq q_a^*$, we have $dq_b = -dq_a$ and, hence,

$$L'(Q, q) = -\frac{dq_a}{dq}(r_a' - r_b') \tag{5}$$

where r_i' is the marginal revenue for the ith market evaluated at q_i. The necessary condition for min. L is $L'=0$. This is obtained either when $dq_a/dq=0$ or when $r_a'=r_b'$. The first possibility implies that the allocation is not affected by the forecast. The decision is not invariant under the forecast; therefore, this equality can only be locally true. In this case L assumes a relative minimum. The second possibility implies that the allocation is optimum under Q and, therefore, $Q=q$. This is the point of absolute minimum.

4. *Two-Market Allocation—Linear Demand Function*

The demand functions are $y_a=a_0-a_1x_a$ and $y_b=b_0-b_1x_b$ $y=P$, p for $x=Q$, q, respectively. Then by substituting these in (4)

$$L = (R_a' - R_b')e_a + (a_1 + b_1)e_a^2 \tag{6}$$

where $e_a=(Q_a-q_a)$ and R_i' is the marginal revenue of the ith market evaluated at Q_i. Assuming that $Q \geqq q_a^*$, $R_a'=R_b'$ by the definition of optimum allocation. By utilizing the necessary condition for maximization, both under Q and q, we get

$$L = \frac{b_1^2}{b_1 + a_1}e^2 = me^2 \text{ where } e = Q - q. \tag{7}$$

This is the loss incurred by allocating total production without knowing its magnitude. We will now show what should be the design of the forecast when the loss is given by (7).

4.1 *Selecting the optimum forecast.* The optimum forecast is obtained by substituting (7) in (3) and selecting the q that minimizes the latter. The result is that the optimum forecast is obtained by taking the a posteriori expectation, that is, $q=E(Q|t)$. This was assumed to be known and in practice could be estimated by the regression of Q on t.

4.2 *Optimum sample size and sampling cost.* The risk of the forecast (r) is:

$$E(L) = mE(e^2) = (k_0 + k_1/n)m \tag{8}$$

where n is the sample size used in obtaining t, and k_0, k_1 are two constants. These constants are the components of the variance of the forecast error that is, k_0 is the forecast variance, uniquely determined by the forecasting method, the magnitude of which cannot be controlled by increasing size of sample. K_1/n is the sampling variance and thus is controlled by n.

The sum of the risk and the sampling cost (C) is referred to as the total loss, TL. The optimum $n(n_0)$ is that n which minimizes TL. Suppose that the sampling cost in linear $C=c_0+c_1n$. Then, $n_0=\sqrt{mk_1/c_1}$.

4.3 *Selecting the optimum method of forecasting.* In (4.1) the optimum forecast was found for a given sample statistic t. In this section a criterion is suggested for selecting the statistic or more generally the method of forecasting. In general, the same data could be processed in several ways to give different statistics, or sometimes the different methods under consideration require altogether a different kind of information. For example, subjective forecasts are based on reports by farmers whereas objective forecasts utilize measurement of physical characteristics. Each method will have a total loss associated with it. Thus, for the *i*th method, we have

$$(TL)_i = C_i(n_i) + r_i(n_i) \tag{9}$$

We then suggest that q_0 is the optimum method if, and only if, $(TL)_0 \leqq (TL)_i$ for all i. The question that immediately arises is at what value of n the comparison is to be made. To this, two answers can be given.

A. *The unrestricted criterion.* The solution is to compare each method at its best. That is, we compare each method at the level where $(TL)_i$ is minimum. Then q_0 is optimum if, and only if, $(TL)_0 = \min_i \min_{n_i} (TL)_i$.

B. *The restricted criterion.* When the risk component is large compared to the sampling cost, the optimum n may require a considerable outlay for sampling. Although such outlay is justifiable, the forecaster might be required to work with limited funds. Let the upper limit for the sampling cost be C''. This determines a sample size, n_i'', for each of the i methods. If $n_i'' \geqq n_{0i}$ (n_{0i} is the opt. n_i), then the unrestricted solution is still valid. If $n_i'' \leqq n_{0i}$ at least for one i, then the solution is: select q_0 if, and only if, $q_0 = \min_i r(n_i')$ for $n_i' = n_i''$ if $n_i'' \leqq n_{0i}$ or $n_i' = n_{0i}$ otherwise. The critical parameters in this case are the two components of variance as can be seen in (8).

5. *Extension to Surplus Removal*

When one of the markets is a zero revenue market, the assumption made in obtaining (7) from (6) may not always hold. Explicitly, the marginal revenues of the two markets do not intersect within the range of the true output and the forecast with probability 1. For if they did, the crop would be in permanent surplus and require a different treatment from the one considered.

If the zero revenue market is given priority, then (6) can be expressed as:[4]

$$L = (p_{12} - p_{21})b_1(Q - b_0/2b_1) + b_1(p_{21} + p_{22})e^2 \tag{10}$$

[4] This is not in line with the rule to be suggested later but fits many situations where the order of allocation is predetermined, namely, plowing under of a crop or stripping fruit from the tree prior to the harvest.

where

$$p_{ij} = \Pr.\ (q_{ai}, Q_{aj}),\ i, j = 1, 2, \text{ and } x_1 = 0,\ x_2 > 0$$

$$\text{for } x = q_a, Q_a \cdot \sum_{i,j} p_{ij} = 1.$$

The Bayes solution for the optimum forecast is the same as in (4.1), namely, $q = E(Q|t)$. The determination of the sampling size and the selection of the method of forecasting follow in an obvious way.

When

$$p_{21} = p_{12}, \tag{10}$$

becomes

$$b_1(p_{21} + p_{22})e^2. \tag{11}$$

Then (11) is, except for the scale, the same as (7) and thus invariant under the intercept. This assumption is not unrealistic in many cases and in practice could offer a good approximation.

6. *Allocation Among Related Markets*

Our comments will be made in reference to the following demand functions:

$$y_a = a_0 - a_1x_a - a_2x_b \text{ and } y_b = b_0 - b_1x_b - b_2x_a \tag{12}$$

where $y = P, p$ for $x = Q, q$, respectively. In this case the loss function is:

$$L_d = \frac{[b_1 - \frac{1}{2}(a_2 + b_2)]^2}{(a_1 + b_1 - a_2 - b_2)} e^2 \tag{13}$$

When $a_2 = b_2 = 0$ (that is, the markets are independent) (13) becomes identical with (7). When the markets are complementary (a_2, b_2 are negative) the loss is likely to be larger than if the markets are competitive (a_2, b_2 are positive). The impact on the design of the forecast is similar to the previous cases, that is, the Bayes solution is the same as stated in section (4.1).

7. *Illustration*

In this section the loss function involved in forecasting production of lemons for the purpose of allocating production between the fresh and the product (processed products) market will be estimated. The function to be maximized by the allocation is gross revenue. Since the production in the period under consideration was larger than the ex ante allocation to either market, and since the marginal functions intersect within the range of the actual production, the loss function is given by (13) which in the event of independence between the two markets collapse to (7). In order to estimate the loss function, it is necessary to know the slopes of the two demand func-

tions. For this we use the following regressions obtained in a recent study for lemons.[5]

$$y_f = a_0 - 4.65(10^{-7})x_f - 1.66(10^{-7})x_p$$
$$y_p = b_0 - 1.53(10^{-7})x_p - 0.17(10^{-7})x_f$$

where a_0 and b_0 combine the effect of the intercept and the other independent variables included in the original equations, x is the quantity measured in boxes, and y is the "on-tree" price in dollars per box. The subscripts f and p stand for the fresh and the product markets, respectively. For purpose of illustration, we will present the loss function for both cases—related and unrelated markets. Which of the two markets has the priority will not be assumed beforehand, and the loss is computed for each of the two possibilities. The loss is calculated for various values of the relative error when the actual production is taken to be $1.178(10^7)$ boxes.[6] The estimated loss is given in the table below. Which market is given priority is of prime importance for the loss is much smaller when the product market is treated as the residual. A rule for allocation is contained in the next section.

8. *The Decision on Market Priority*

We suggest the rule: Priority should be given to the market with the steeper demand curve.

The error of the ex ante allocation is smaller in the market with the steeper slope. Therefore, it is desirable to equate the ex ante and the ex post allocation for this market, and let the other market absorb the difference. This is equivalent to the rule suggested above.

Absolute value of e		Loss when respective markets treated as residual			
		Independent markets		Related markets	
		Fresh	Product	Fresh	Product
per cent	10^5 boxes	dollars			
1	1.178	4,856	526	4,451	121
2	2.356	19,423	2,103	17,802	483
5	5.890	121,380	13,141	111,251	3,016
10	11.780	485,661	52,577	445,132	12,068
15	17.670	1,092,388	118,261	1,001,225	27,145
20	23.560	1,942,295	210,272	1,780,206	48,265

9. *Generalization to I Independent Markets*

The results are not restricted to two-market cases and can be generalized. This will be done within the framework suggested by the following assump-

[5] Sidney Hoos, and R. E. Seltzer, *Lemons and Lemon Products, Changing Economic Relationships, 1951–52* (Berkeley: 1952), Table 9, p. 77. (California Agricultural Experiment Station Bul. 729.)

[6] This figure represents the average total utilization, fresh plus product, for the years 1946–1950. *Ibid.*, Table 7, p. 75.

tions: (1) The markets are independent. (2) The demand functions are linear of the form $y_i = a_i - b_i x_i (i = 1, \cdots, I)$ and $y = P$, p for $x = Q$, q, respectively. (3) The decision maker intends to maximize revenue by appropriate allocation of the total production to the I markets.

The ex ante allocation assigns the quantity q_i^* to the ith market. The set $(q_1^*, \cdots, q_I^*)$ is determined in such a way that $\sum R_i$ is maximized under the constraint $\sum q_i^* = q$ where R_i is the revenue function for the ith market. The ex post allocation $(q_1, \cdots, q_I)$ $\sum q_i = Q$ is defined by $q_i = q_i^* w_i$. The set $(w_1, \cdots, w_I)$ is a rule according to which the ex ante allocation is transformed to the ex post allocation. This set depends on the pair (Q, q) and, therefore, has at least one random element in it.

For a given production Q, there is a set of quantities $(Q_1, \cdots, Q_I)$ that maximizes $\sum R_i$ under the constraint $\sum Q_i = Q$. The loss is then

$$L = g_0 + g_1 e + g_2 e^2 \tag{14}$$

where

$$g_0 = \sum Q_i^2 (1 - w_i)^2 b_i, \quad g_1 = \frac{2}{B} \sum Q_i (1 - w_i) w_i,$$

$$g_2 = \frac{1}{B^2} \sum w_i^2 / b_i \text{ and } B = \sum 1/b_i.$$

Thus, the loss is a second degree polynomial in e. The coefficients of the polynomial depend on the slope of the demand function, the Q_i's and the w's. Since at least one of the w's depends on (Q, q), the g's are random and only knowledge of the nature of the dependence of w on (Q, q) will allow explicit expression of L in terms of e and fixed w's. The importance of such an expression can be demonstrated by considering the impact of (14) on the design of the forecast. The Bayes solution for the optimum forecast is $q_0 = E(Q \mid t) + g_1/2g_2$. That is, the optimum forecast is obtained by adding a constant to the regression of Q on t. The risk is $r = g_0 + g_1 E(e) + g_2 E(e^2)$. In general, we let $E(e) = h_0 + h_1/n$. That is, we assume that the bias of the forecast consists of two components, one of which depends on the size of the sample. Then we have $r = (g_0 + g_1 h_0 + g_2 k_1) + (g_1 h_1 + g_2 k_1) \mid n$. The risk is a function of the slopes of the demand functions and of the two components (sampling and forecast) of both the bias and the variance of the forecast. After the expression for the risk is obtained, the determination of the sampling size and the selection of the optimum method of forecasting offer no difficulties.

10. Implication for Marketing Priorities

The rule of assigning market priorities can also be generalized to the I market case. The error of the ex ante allocation $(Q_i - q_i^*)$ is equal to $(1/Bb_i)e$ and, hence, is inversely related to the slope of the demand function.

Consequently, it should be most desirable to equate the ex ante and the ex post allocation for the markets with the larger slopes. If we renumber the markets according to the rank of the magnitude of their slopes (the steepest is assigned rank 1, etc.), the rule is: Make

$$w_1 = 1 \text{ if } Q \geqq q_i^*, \text{ or } w_1 = Q/q_i^*, \text{ and } w_2 = \cdots = w_I = 0.$$

If $w_1=1$, set $w_2=1$ if $Q-q_1^* \geqq q_2^*$ or $w_2=(Q-q_1^*)/q_2^*$ and $w_3=\ldots=ww_I=0$. This process is continued until either (1) some w is zero or (2)

$$w_I = \left(Q - \sum_{i=1}^{I-1} q_i^*\right)/q_I^*.$$

LINEAR PROGRAMMING—A NEW APPROACH TO INTERREGIONAL COMPETITION IN DAIRYING[1]

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THE dynamics of our modern economy create problems continuously for any manager of resources. As time passes, adjustments are necessary in order to reduce misallocation of resources. A particular line of production may be most profitably produced in a particular region now, but ten years hence be quite unprofitable.

The large scale of the dairy industry with its many complicating features makes it difficult to formulate a satisfactory interregional analytical framework, especially when trying to emphasize solution of dynamic problems. A model depicting interregional competition should embody the principle of specialization, the principle of comparative advantage, location theory, and the theory of general equilibrium. Most of the studies which have been done in the past have worked with rather restricted regional areas and have usually tackled only part of the products and institutions.

Mighell and Black[3] studied competition in dairy production between the Northeastern and Lake States, for the New England market for fluid milk and cream. J. B. Hassler[4] investigated pricing efficiency in the manufactured dairy products industry in the United States from the plant to the wholesale level. His study was limited in scope to the West and Midwest. Bredo and Rojko[5] investigated prices in milksheds of the Northeastern States to determine (1) the efficiency of the pricing relationships between milk products and milk markets, (2) how good the adjustment was relative to location of milk supply areas to these markets, and (3) what the process and amount of adjustment in the location of milk supply areas was to these markets. In addition, Rojko[6] specified

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[2] The author wrote his Ph.D. dissertation based on this research entitled "Linear Programming Approach to Optimum Resource Use in Dairying." The author is deeply indebted to Dr. C. E. French, who directed the study and served as the author's major professor.

[3] Ronald L. Mighell and John D. Black, *Interregional Competition in Agriculture*, Cambridge: Harvard University Press, 1951.

[4] J. B. Hassler, "Pricing Efficiency in the Manufactured Dairy Products Industry," *Hilgardia*, Berkeley: California Agricultural Experiment Station, Vol. 22, No. 8, August 1953.

[5] William Brede and Anthony S. Rojko, "Prices and Milksheds of Northeastern Markets," Northeast Regional Publication No. 9, Bulletin 470, Amherst: University of Massachusetts Agricultural Experiment Station, August 1952.

[6] A. S. Rojko, "An Application of the Use of Economic Models to the Dairy Industry," *Journal of Farm Economics*, December 1953, p. 834.

relationships within the dairy industry and between the dairy and feed-livestock economy in relation to the total economy in terms of mathematical equation models. Hammerberg, Parker, and Bressler[7] studied the effect of transport costs upon area prices and geographical flows in the Connecticut milk market when buyers and sellers are located at different points.

These studies have utilized various approaches to the problem of interregional competition including budgeting of individual farms, a study of intermarket price relationships, and econometric analyses. Recent developments in spatial theory couched in terms of linear programming together with the recent availability of the digital computer, have made possible the handling of tremendous quantities of data in applied problems. Koopmans[8] illustrated the use of the transportation model and Samuelson[9] showed how it is a part of or inside the more general problem of spatial equilibrium.[10] Baumol[11] presented the formal model for spatial equilibrium and Judge[12] applied it to the egg segment of the poultry industry while Fox[13] applied it to the livestock feed economy.

This approach to solving spatial problems allows the space factor to be treated explicitly. Thus, the solutions show how distance affects interregional product flows. Since the body of knowledge concerning the dairy industry has been building up over the years, it seems that reasonable estimates of many of the data needed for interregional analyses are now available. However, within any one analytical framework, the problem of securing proper data is a formidable one. Any model developed to study spatial problems necessarily must give a great amount of im-

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[7] D. O. Hammerberg, L. W. Parker, and R. G. Bressler, Jr., "Efficiency of Milk Marketing in Connecticut," Bulletin 237, Storrs: University of Conn. Feb. 1942.

[8] T. J. Koopmans, *Activity Analysis of Production and Allocation*, New York: John Wiley and Sons, 1951.

[9] P. A. Samuelson, "Spatial Price Equilibrium and Linear Programming," *The American Economic Review*, Vol. 42, No. 3, June 1952, pp. 283-303.

[10] Briefly, the difference between the two models is: In the transportation model, consumption requirements at each of the destination points are predetermined and thus transportation costs alone determine interregional flows. In the spatial equilibrium model, consumption requirements are determined via a demand equation; thus prices plus transportation costs determine interregional flows. In a perfectly competitive framework, each model gives the same answer. The transportation model is simpler and easier to use. If the set of equilibrium prices is desired, they can be easily computed from the solution of the transportation problem.

[11] W. J. Baumol, "Spatial Equilibrium with Supply Points Separated From Markets with Supplies Predetermined," Ditto Report, U.S.D.A., B.A.E., 1952.

[12] George C. Judge, "Competitive Position of the Poultry Industry—A Spatial Equilibrium Model for Eggs," Bulletin 318, Storrs: Connecticut Agricultural Experiment Station, January 1956.

[13] K. A. Fox, "A Spatial Equilibrium Model of the Livestock-Feed Economy in the United States," *Econometrica*, Vol. 21, 1953, pp. 547-566.

portance to transportation. Satisfactory transportation data are not only difficult to obtain but difficult to use in an applied problem. Likewise, consumption estimates by states are difficult to make.

The two objectives of this paper are (1) to illustrate the application of linear programming theory to spatial problems as a means of evaluating its usefulness in agricultural interregional trade analysis, and (2) to solve with use of the transportation model of linear programming, the optimal resource use pattern for movement of products from surplus to deficit areas, location of processing firms, and location of production in the dairy industry.

While previous studies of interregional competition have been restricted to one or two areas within the United States, the models illustrated in this paper will include the entire nation. In some instances, aggregation will be necessary; however, in most instances it will not. Products will include fluid milk, butter, cheese, and evaporated milk. Past, present and future time periods will be considered.

The Transportation Model

The three types of data necessary to solve the transportation model include production figures, consumption estimates (requirements), and a structure of transportation costs among states. The problem is one of finding the optimal movement of product which will satisfy consumption needs of each state from given production using prevailing transport costs in such a way that total transport costs are a minimum. There is assumed to be no transport cost involved for quantities consumed intrastate. Transportation costs for fluid milk are assumed to be independent of volume or direction and for manufactured dairy products, independent of direction only. The conceptual framework used to explain the mechanism which generates the geographical flows among states is the abstract, perfectly competitive market in space, form, and time. The product is assumed to be homogeneous, and consumers indifferent as to the source of product which satisfies their demands.

The simplified model consists of 48 sources each with a predetermined quantity of product produced. There are also 48 markets each with a predetermined quantity of product required. The matrix formulation and diagrammatic picture for three states would appear as in (A) and (B).

Sources of Data

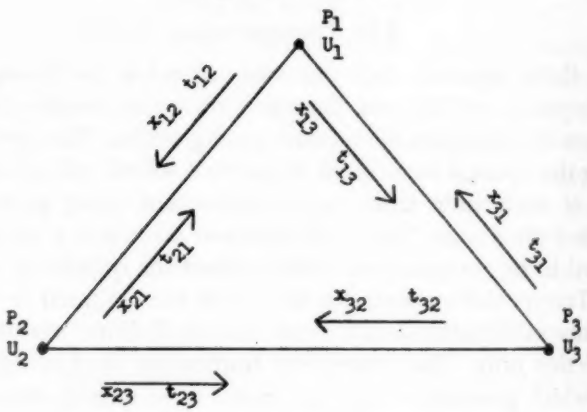
Production. Actual production figures as reported by the U.S.D.A. by states were used.

Consumption. Since personal disposable income of consumers is a general demand shifter of primary importance, consumption estimates based

(A) Matrix Formulation

x_{11}	0	x_{12} t_{12}	x_{13} t_{13}	P_1
x_{21} t_{21}	x_{22}	0	x_{23} t_{23}	P_2
x_{31} t_{31}	x_{32} t_{32}	x_{33}	0	P_3
U_1	U_2	U_3		

(B) Diagrammatic Picture



NOTATIONS:

- x_{ij} Amount of shipment (if any) from state i to state j.
- t_{ij} Transportation rate for moving product from state i to state j.
- P_i Amount of production in state i.
- U_j Amount of consumption in state j.

OBJECTIVE:

To make $\sum x_{ij}t_{ij}$ a minimum.

on income differences by states were used.[14] Price is excluded by this method but the models (except for one) deal with only one year (1953), and price variations among geographic regions are not large, particularly

[14] First, an attempt was made to utilize estimating equations developed in the United States Department of Agriculture by A. S. Rojko. The use of these equations gave an estimate of per capita milk consumption which was very close to the United States average. However, when these equations were applied uniformly by states, the variation was much wider than was possible.

for manufactured dairy products. The use of income elasticity coefficients as a base for estimating consumption seems quite applicable to a broad, interregional study. These coefficients are derived by studying buying habits of different consumers with different incomes. While this is recognized as a limitation in determining accurate coefficients for demand studies, it seems quite desirable for making interstate comparisons.

Transportation rates. For fluid milk, a rate of 1.92 cents per cwt. per 10 miles of distance was used independent of volume or direction.[15] For manufactured dairy products, rates were supplied by Carnation Milk Company, Land O' Lakes, and Kraft Food Company. General rates chosen varied by distance but were independent of direction.

Models Including Transportation Cost Only

From Matrix (A) the following model variations were studied:

Model A. An aggregate milk model using total milk production. This is a very abstract model assuming all milk moves in the fluid form. It is useful in studying general movements.

Model A1. Same as Model A except supply and demand are projected to 1965. Since supply was projected on a straight percentage base for each state, it was essentially a demand projection based on expected increases in population by states. It is useful in studying what future adjustments are necessary in response to shifts in supply and demand.

Model A2. This model illustrates the effect of one type of restriction in the dairy industry. Any restriction which can be measured in terms of cost can be introduced into the transportation model. In this case, the cost of transporting milk into the 16 states having state milk control was increased by five percent of the average price paid by dealers in these states. Thus, the effect of restricted entry into protected state markets can be studied.

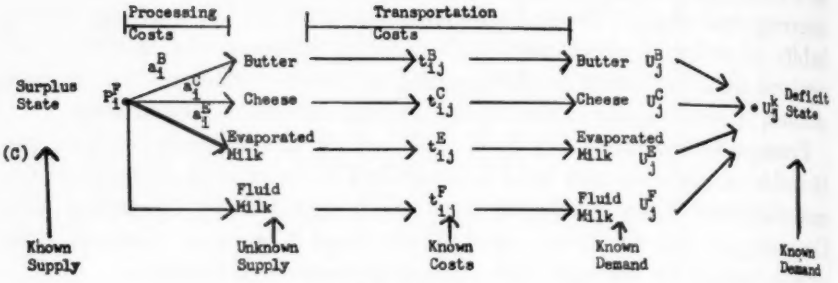
Models B, C, E, and Q. These are individual product models for butter, cheese, evaporated milk, and fluid milk respectively. Using given production figures, consumption estimates computed from Mighell and Black's income elasticity coefficients, and a structure of transportation costs, optimal movement patterns for individual products can be studied. These movement patterns are particularly useful to national chain organizations distributing on a nationwide basis.

Models Including Transportation and Processing Costs

Model F. In previous models, only transportation costs were considered. In Model F, processing costs of the manufactured products were added to transportation costs. States were aggregated into 24 regions and con-

[15] Taken from U.S.D.A., A.M.S., "Regulations Affecting the Movement and Merchandising of Milk," Marketing Research Report No. 98, Washington: U. S. Govt. Printing Office, June 1955, p. 51.

Diagrammatic Picture



Matrix Formulation

(D)

		Region 1		Region 2		
Region 1	F	x_{11F}	None	x_{21F}	t^F_{21}	U^F_1
	B	x_{11B}	a^B_1	x_{21B}	$a^B_2 \neq t^B_{21}$	U^B_1
	C	x_{11C}	a^C_1	x_{21C}	$a^C_2 \neq t^C_{21}$	U^C_1
	E	x_{11E}	a^E_1	x_{21E}	$a^E_2 \neq t^E_{21}$	U^E_1
Region 2	F	x_{12F}	t^F_{12}	x_{22F}	None	U^F_2
	B	x_{12B}	$a^B_1 \neq t^B_{12}$	x_{22B}	a^B_2	U^B_2
	C	x_{12C}	$a^C_1 \neq t^C_{12}$	x_{22C}	a^C_2	U^C_2
	E	x_{12E}	$a^E_1 \neq t^E_{12}$	x_{22E}	a^E_2	U^E_2
		P^F_1		P^F_2		

NOTATIONS:

a_i^k—Processing cost per unit.
P_i^F—Production in state i.
t_{ij}^k—Transportation cost per unit.
U_j^k—Consumption in terms of milk equivalent

Subscripts denote regions.
Superscripts denote products.

Product F—Fluid milk
B—Butter
C—Cheese
E—Evaporated milk

x_{ijk}—equals amount of shipment (if any) from state i to state j of product k.

OBJECTIVE: To make $\sum x_{ijk}\, a_i^k\, t_{ij}^k$ a minimum.

sumption in each region was specified by product for fluid use, butter, cheese, and evaporated milk. For two states, the matrix formulation and diagrammatic picture would appear as in (C) and (D). Thus, using state total milk production figures and a structure of transportation and processing costs, the problem becomes one of determining the optimal location of processing plants by product to minimize cost of processing and the optimal movement of each product into consumption to minimize transportation cost. In general, the methodology for developing processing

costs by states was based on that used by Hassler[16] in his pricing efficiency study of the manufactured dairy products industry. Since 1953 data were used, Model F approximates the actual situation existing in 1953. The optimal solution is useful in studying how much the actual situation in 1953 deviated from the ideal or optimum.

Model F1. This model was used to study the effect of an expanded export market for butter, cheese, and evaporated milk on the domestic dairy economy. The solution points out desirable adjustments which should be made particularly relative to processing firm location.

Models Including Production Costs in Addition to Processing and Transportation Costs

In previous models, total production by state or region was specified or predetermined. In this model, this restriction was relaxed, production costs were introduced,[17] and the optimal solution indicated optimal location of production in addition. Since production restrictions are relaxed, the problem can easily be solved by hand.

Model G1. Since the solution in Model G dictated that the states of Wisconsin and New York should produce an impossible amount of milk, Model G1 restricted these two states production to a maximum amount dependent on the availability of cropland in each state.

Model G2. This model studied the effect of the innovation which makes possible the making of fresh concentrated milk. Transportation costs for fluid milk are in effect cut by ⅔ and a processing charge is added.

Findings and Conclusions

1. The transportation model of linear programming is applicable for the study of optimum resource use patterns within dairying and among regions in the United States.

2. The accuracy of the findings of this study and their subsequent use are limited more by inadequate data than by analytical procedure or model.

3. Few data were available relative to actual movements of products. Thus, the degree to which the quantitative answers in the study approximate or deviate from the actual situations could not be adequately assessed. Pertinent descriptive material in some cases gives help on this problem.

4. Consumption estimates of dairy products based on geographic in-

[16] J. B. Hassler, *op. cit.*, Appendix B.

[17] A production cost to produce 100 pounds of milk was built from labor and food indexes. Feed was weighted at 56.3 percent of the total and labor at 23.7 percent. Total cost of feeding a cow in each state was divided by averaging production per cow in the state to get a production cost per cwt.

come differentials and income elasticity coefficients seem reasonable and should be useful and valid for a broad interregional study of this nature.

5. General transportation rate data applicable to this type of study can be secured. However, refinement of these data to vary rates relative to direction as well as volume would have been desirable. This type of refinement would be advantageous particularly if the model were applied to individual firm problems.

6. Processing and production cost data are difficult to secure. Data good enough even to indicate direction of relationships do not come easily. To keep such problem formulation wide enough to treat adequately the opportunity cost item creates a problem.

7. The seasonality of milk production which could not be reflected in this type of study probably tends to distort some of the answers in the models. A number of states would probably produce little (if any) manufactured dairy products were it not for surplus milk during only a few months of the year.

8. With a minimum of restrictions (Model A), the following general pattern of milk movements would result:

Exporting region	*Importing region*
Wisconsin	East and New England
Minnesota	West, South, Southeast
Iowa	South, Southeast
Kansas	South
Nebraska	Southwest
Utah	West

9. This general pattern of movement ws found throughout the models until production costs were introduced (Model G). With the inclusion of production costs, Wisconsin and Minnesota produced virtually 100 percent of all manufactured dairy products. More than one half of the states (26) did not even produce milk for their own fluid consumption.

10. The variation in regional or state costs for processing manufactured dairy products was so small that it did not materially affect the pattern of movements.

11. The primary factor in determining production location in Model G where production was unrestricted in any area and all costs were included was production costs which varied considerably by state. This considerable degree of variation was primarily due to differences in production per cow among states.

12. Comparison of the total cost in Model G (near the ideal situation) with the total cost of Model F (which best portrays the situation in 1953) lends some evidence that the allocation of resources in dairying and the

marketing patterns of dairy products tend to conform to optimum conditions quite well.

13. Also, the total cost figure in Model F did not seem to be out of line with figures reported for gross farm value of dairy products or for total retail sales value of the industry.

14. Results in the model which included transportation and processing costs (Model F) and those in Model G which included production costs in addition, indicated that production adjustments are bracketed to some degree by these two models. In Model F which includes no production costs, results favor decentralization of production and processing firm location away from the Lake States. In Model G where production costs are included, the results favor continued concentration in the manufactured dairy products industry for Wisconsin, Minnesota, and Iowa. If the production cost data adequately reflect variation among regions in costs of producing milk, then the latter (continued concentration in Lake States) would be expected to continue as long as they could keep their efficiency relatively high (costs low). Should each state reduce their costs of producing milk to that of Wisconsin, then decentralization would be the trend expected and also the one desirable from the standpoint of minimizing cost to the industry.

15. Several variations of the above general models (Models A, F, and G) were made. The results from these variations indicate the following:

a. The projected estimated model for 1965 indicated that shifts in population in the next 10 years will not materially affect the optimal aggregate movements of products relative to direction.

b. In Model F1 where exports were introduced, the results substantiated the increase in the number of processing plants for evaporated milk on the West Coast. The results also substantiated the more recent increase in the number of evaporated milk plants in Ohio and West Virginia.

c. With the acceptance of fresh concentrate by consumers as equal to whole fluid milk, results in Model G1 indicate that it could capture 44 percent of the market for fluid consumption.

d. The introduction of the restriction in Model A2 resulting from state milk control in 16 states had little effect on the pattern of movements. However, it did suggest that a "little" restriction may result in a rather large increase in costs to the industry. In Model A2, an increase in transportation costs equivalent to five percent of the average price of milk for milk moving into the 16 states having milk control resulted in a 9.5 percent increase in the total transportation bill.

e. In the several variations just discussed, general pattern changes of any magnitude were not noticeable. However, in each case and particu-

larly the export variation and the state milk control variation, the increase in aggregate cost was sizable. These aggregate effects are of particular concern to public policy planners and national chain organizations which distribute products nationally.

17. The primary contribution made by this study was one of methodology in pointing out how interregional competition problems can be formulated within linear programming theory. A second contribution was in development of data, particularly consumption estimates by states. Third, while generalizations were difficult to make because of lack of evidence, the quantitative answers given by solving the various models gave considerable insight into the nature of interregional competition within the dairy industry in the United States.

DISCUSSION: AWARD-WINNING GRADUATE STUDENTS' CONTRIBUTED PAPERS

JARVIS E. MILLER
A. & M. College of Texas

I have found these papers to be very interesting and challenging, and I am glad to see the Association sponsoring a contest such as this one. In my discussion, I shall proceed in the order in which the papers are listed in the program.

Miss Goodwin's paper is interesting and well written. I have had very little experience with tax problems, and I am unfamiliar with the tax system in Connecticut, so I do not feel qualified to discuss her paper in detail.

In her paper, Miss Goodwin states that, "Because a political recommendation is of little immediate use if it is politically unacceptable, this analysis works within certain rather obvious limitations." This, of course, is the problem that social scientists face constantly in their research—should we seek the ideal, or should we seek the politically acceptable? I realize that in many of our studies at land grant institutions, we have to choose the politically acceptable solution. I wonder, however, if we don't need to seek out the ideal solution and then present a program that will lead us gradually toward that ideal.

I realize the problems that limitation of space presents, however, I should have liked to have seen an expansion of the discussion pertaining to the relationship between per capita expenditures and size of town. There can be a number of reasons for the tendency of per capita expenditures to rise with the size of the town. However, it seems to me that there are two very important, and for purposes of analysis, opposite

reasons for this relationship. These are: (1) the actual increase in the amount of services that are provided, and (2) the increased costs that actually result from congestion.

It seems to me that to really analyze this problem, we need to separate these two factors if possible. I must admit that this would be difficult.

Miss Goodwin also states that per capita expenditures "tend to increase faster than per capita corrected assessments." I don't know her definition of corrected assessments, but I wonder how much of this lag is due to a tendency for assessments to lag behind real increases in property values. If, as I suspect, assessments do tend to lag behind changes in real property values, the problem would be one of keeping assessments current, rather than changing the grants. Her conclusions and recommendations appear to be reasonable and workable.

I found Mr. Mundlak's approach unusual and intriguing. His criterion of a good forecast was the loss resulting from the forecast rather than the true outcome. This assumption is subject to a considerable amount of debate. Actually, forecasts that closely approximate the actual are least loss, are they not?

Mundlak confines his analysis to the situation where monopoly exists, and the seller is able to control the flow of a commodity into different uses. In his illustration of the importance of production forecasts in price formation, he cites the 1951 situation with respect to the cotton crop forecasts. I would have liked to see him discuss the problems involved in designing a cotton crop forecasting system, since cotton is marketed under much more competitive conditions than the example he uses. Would the result have been the same?

Mr. Learn's paper is interesting, and I sympathize with him in his problems. I wish that he had given us a little better insight into his over-all problem.

He attempts to obtain the farm demand for livestock products from the retail demand. Could he not also study the factors associated with the farm prices of livestock and livestock products?

In the first retail demand equation that he develops, he includes both disposable personal income and an index of prices of all commodities. I suspect that there is a rather high degree of correlation between the two.

In developing his equation expressing the relationship between the marketing margin, the quantity marketed, and the costs of performing marketing services, Learn states that, "The quantity effect on margins results from the tendency of merchants to maintain constant percentage mark-ups." He states further that, "if quantity increases, the absolute marketing margin will fall with the accompanying decline in price and vice versa." One of the points that we try to make in our elementary

marketing courses and in our extension marketing work is the fact that marketing margins are "sticky." In his model, Learn uses the nonfood index as a measure of the marketing margin. He states that the two are highly related ($\gamma^2 = .98$). Would it not be better to use the marketing margin itself? Because of its relative stability from year to year, it could be estimated rather closely.

I question his assumption that dairy products and eggs are substitutes for red meats. It seems to me they should be omitted from his supplies of competing products when he is studying beef, pork, and broilers.

Mr. Snodgrass's paper was also very interesting. I wish that he had found it advisable to revise his paper slightly to eliminate and condense some of the review of literature and other general information so that he could have expanded upon the meat of the paper—the models and his findings and conclusions.

Any study of this nature requires some very broad assumptions and is subject to the limitations that these assumptions impose. One of these assumptions is involved in his production costs. This is a very crucial point in this analysis, and may obscure one of the real factors in this problem—that of differing costs of production from state to state. This may partially account for his finding that the actual 1953 condition closely approximated the ideal. There are a number of similar assumptions in this paper. Among these are freight rates and market regulation.

I would have liked more discussion about the estimates of per capita consumption that Snodgrass developed. He states that when he used Rojko's estimating equations to develop estimates of per capita milk consumption by states, "the variation was much wider than possible." This point is not clear. The use of income elasticity coefficients for the United States as a whole could have led to the same problem. What is the basis for deciding the appropriate estimate?

DISCUSSION: AWARD-WINNING GRADUATE STUDENTS' CONTRIBUTED PAPERS

RICHARD BEEN
Safeway Stores, Inc.[1]

My discussion will deal mainly with the paper of Mr. Yair Mundlak, "Economic Considerations in the Design and Evaluation of Production Forecasts."

[1] These are personal views of the discussant, and in no way relate to his company affiliation.

The paper as read differed in some respects from the version that was sent to me for preliminary review. I shall take the liberty of including some material of the original version under my comments.

This paper impresses me as being highly original. It is by no means an imitation of other work, nor is it a variation on an old theme. It is one of the rare steps forward onto new ground. And any such step runs the risk of falling onto quicksand. As a marketing economist and as a former employee of the crop and livestock estimating service of the USDA, I feel a particular interest in the fusing of the controlled market allocations and the underlying production estimates into interdependent processes.

I would not come to the same conclusion as the author. This is by no means a criticism of his analysis, concept or theory. It is more a matter of interpretation. Mundlak suggests that the government crop estimating service should be guided by the criteria that he advances in making their forecasts of production. I would say, on the basis of his analysis, that he has shown how the market control authorities should *modify* and *adapt* the traditional production forecast to provide the optimum basis for their determination of market quotas. For that purpose they would need more detailed information describing the statistical bases of the estimate, their distributions, and the method of estimating.

Recommendation of such procedures may perhaps have been Mundlak's intention. If that is so, then the presentation does not clearly convey the idea to the reader, and perhaps he really intended that the government estimates should be derived on the basis of the criteria he proposes. I cannot agree with this latter view.

Various degrees of patronizing criticism of the crop and livestock estimating services of the USDA have, for many years, been a favorite pastime of statisticians, agricultural economists, and others. The criticism is usually directed to their use of statistical methodology in the estimating processes, and overlooks their impressive record as pioneers in many techniques of sampling and estimating.

A basic feature in an understanding of the crop estimating services of the USDA is their broad responsibility to all interested parties in the U.S. and even to the rest of the world. Crop estimating is not done in the interests of the farmer per se, or in the interests of the food processor, the distributor, the consumer, or the politician. In the modern world, it is a fundamental social responsibility that has been accepted as such.

My observation has convinced me that the federal crop and livestock estimating service sets the two following primary goals for all of their estimates: (1) that the estimates should be unbiassed, and (2) that the estimates should be as accurate as possible, in some sense such as mini-

mum variance, under the limitations of available resources. These goals certainly are nonpartisan.

Is it possible that either of these goals or criteria should give way to other criteria, especially to criteria developed in terms of the economic loss to some *particular* economic group in the economy? I would say emphatically, "No." Perhaps, if the economic loss criteria could be broadened to include simultaneously *all* interested parties, those combined criteria would be acceptable. But intuitively there would seem to be a good deal of cancelling of opposing interests and "losses," with an end result possibly close to the "unbiassed, least-variance" goal.

Undeniably action based on a forecast subject to error will entail some risk of loss in any planning of action possessing an optimum under perfect knowledge, as Mundlak points out. This calls for reduction of estimate error variance, one of the accepted goals in crop estimating. Reduction of the error variance will reduce the risk of economic loss. But the results of applying his criteria go beyond this simple proposition.

Orienting a production forecast to the incident economic loss of some particular economic group implies that the forecast will become *biassed* in some fashion. Consistent underestimate might boost prices to producers for a time, but eventually the consistent bias would be recognized and discounted by the industry and its effect would be cancelled.

In Mundlak's illustrations, I am struck by the repeated recurrence of the ordinary regression line reading as the best estimate under his criteria. That is the typical "crop-estimate" forecast. But those results apparently are a consequence of certain special characteristics of his examples. First, he assumes monopoly market control possessing an optimum revenue-maximizing allocation under perfect knowledge of the production outcome. Second, his detailed examples are for linear demand functions, and therefore linear marginal revenue functions, which involve a symmetry of loss about any optimum point. And third, the symmetry in the distribution of errors of the forecast estimate combines with the symmetry of the loss to produce a symmetry of risk for alternative values of the forecast.

Nonlinear marginal revenue markets will generally involve loss functions and risk functions no longer having the property of symmetry, as graphic experimentation will show. And this would appear to call for an optimum forecast that is biassed. My position is that the market control authorities should be free to apply such optimizing bias to the unbiassed forecast, for use in their market allocations, but that the government crop estimating service should not do so.

Similar comments apply to Mundlak's sections on selecting the optimum method of forecasting. The criteria of "unbiassed, least-variance" esti-

mates lead to selection of an "optimum" method. His criteria should often select the same methods. But, where his method was *not* the "unbiassed, least-variance" one, I would say it is inferior for purposes of government crop estimating. And the "best" estimating procedure might well combine several "methods," rather than select a single method out of all alternatives.

I congratulate Mundlak on a highly imaginative and creative piece of work. It should guide the market planners, although I question whether it should guide the crop estimators.

CREDIT AND INVESTMENT IN AGRICULTURE

Chairman: I. W. Duggan, Trust Company of Georgia

ECONOMIC CONSIDERATIONS IN MAKING TIMBER LOANS

ELI FERGUSON
Second Vice President, The Equitable Life Assurance Society of the United States

ECONOMIC considerations are paramount in every investment a prudent lending institution makes. Loan officers and analysts are charged with the serious responsibility for investing other peoples' money on a basis that will assure it being repaid in an orderly manner, that will earn a reasonable return, and that will serve the best needs of the customer. The loan business as it is conducted today is based on information thoroughly and painstakingly assembled. The information is digested, summarized and analyzed by men who usually have had years of experience watching how their earlier decisions have worked out. Mistakes have been made. But, often those mistakes have proved to be sources of greatest knowledge about the business. Of course, if too many mistakes are made the loan officer is apt to be looking for other employment. He has to have courage to act but must always be careful with the facts.

While institutional lenders attempt to look ahead, they must be guided to a considerable extent by what has happened in the past, both in their own business and in the industry they are considering. Consequently, a new field for investment is seldom entered until some segments of the industry have demonstrated capable management of both production and finances.

Until recent years the business of producing timber could hardly be described as being under good management. The few exceptions merely emphasized the lack of planning and direction in this field. Timber, growing in spite of abuse and neglect, was cut and grew again—in some areas. In other areas, repeated cutting of desirable timber has left the land covered with low-class scrub growth that cannot be removed economically even under present favorable prices. When that was the prevailing condition, the industry could not be considered a suitable field for institutional investment.

The rapid improvement in forest management practices, higher prices for timber products and extensive development of the pulp and paper industry have combined to create an entirely new situation in several important timber-producing regions. In most of the well-managed timber-growing areas, markets for stumpage, logs and timber products are well established. The result is that qualified technicians can now do an acceptable job of determining value and predicting income—the essential prerequisites for lending on real property.

The Equitable Life Assurance Society began lending on timber lands about four years ago. The decision to enter this field was based largely on the recommendation of Porter L. Gaddis, who, for some years prior to joining the Society, had observed the timber-lending operations of the Federal Land Bank of Columbia, South Carolina. Dr. Gaddis was formerly head of the Appraisal Division of the Farm Credit Administration.

The first question we had to answer was the significance of fire in commercial timber production. We were well aware of the prevalence of forest fires but were told that there was no significant danger, at least in the South, of losing merchantable timber by fire. After checking in the field, observing burned areas and talking with several experts, we found this to be true. We also found that fires seldom kill a southern pine tree that has reached four or five inches in diameter. Furthermore, we learned that fire has helped maintain pine forests in areas that would have been taken over by hardwood long ago.

Another early question to be settled was whether or not timber lands could be classed as improved property under the New York State Insurance Law. Our lawyers researched the subject and found that managed timberlands of the type we visualized as security for loans are indeed improved rural property within the meaning of the law. Inspection of such lands will, we believe, convince anyone that this decision was proper.

We also had to consider the question of how to determine the volume of timber on the land offered as security. Although grave mistakes in estimating volume have been made in the past, we determined that many times the reason for the error was that the people making the inventory were not properly instructed as to what was really wanted. Or, if they were instructed, those who relied on the inventory did not know the nature of the instructions. Occasionally it appeared that outright deception was the objective of the cruise.

The timber cruiser should be instructed, for example, whether to include all timber or only that presently in stands sufficiently heavy to warrant logging. Also, it appears the cruiser often failed properly to qualify his figures with the intended user of the data.

Great strides have been made in recent years by using aerial photographs to determine the extent and location of forest types so that properly balanced samples may be taken by ground crews. We also learned that location, quality and stand density, as well as several other factors, have as much to do with value as does volume.

We also had to develop methods for controlling and accounting for the cutting of timber. As a part of that job we developed workable standard mortgage covenants providing for good management, protection from fire and disease, release of timber, cutting reports and other requirements.

Equitable has many years of experience in farm lending. We are thoroughly familiar with the price variations and trends of agricultural commodities. There are, of course, excellent statistical studies available in this field. Our standard practice is to establish a commodity price level for appraisal purposes in local areas based on the staple commodities produced. We thought we could do the same for stumpage. However, after examining the available data and convincing ourselves that stumpage is not a commodity in the usual sense, we abandoned that idea. Published material[1] and our own investigation showed that the range of stumpage prices is so broad that such definite conclusions cannot be made. Prices vary widely for a great many very good reasons, including quality variations, location, logging conditions, local competition and knowledge of the market, to mention a few. We were convinced that the only guidance we could safely give a forecast appraiser was the general price level for timber products that should be assumed in the appraisal. On the supply side, stated very briefly, our conclusion at that time was that there is no present shortage in the South of pulpwood, low-grade sawtimber and the smaller sizes of pine sawtimber, but that the prospects are for a continuing shortage of both high-quality and large saw timber of all the important species.[2] Since 1952 additional pulp mills have been established in the South and, while there is still no shortage of pulpwood, there is a very strong demand, which seems to assure a firm price for pine pulpwood.

Even though average prices received for stumpage from year to year are of little direct value for appraisal purposes, they do show trends. Furthermore, sufficient evidence is available to warrant the conclusion that there is a rather close correlation between average stumpage prices and lumber prices even though stumpage prices lag behind lumber prices. This belief was concurred in by economists of the U.S. Forest Service. Since there are suitable long-term price series available for several important timber products, we transferred our attention to a study of the long-term price movements of lumber. Indications are that in the 12 years following the beginning of World War II sawtimber stumpage prices increased 300% to 400%. Our problem then was to determine the price level appraisers should assume in arriving at a value for making the usual type of timber loan.

At this point I should like to refer to the Stanford Research Institute

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[1] Henry B. Steer, *Stumpage and Log Prices,* for years 1940, '41, '42, '43, and '45, U.S.D.A. Statistical Bulletins 76, 78, 79, 80, and 82.

[2] For example see Forest Survey Release 71, Marc h1953, Philip R. Wheeler, *Forest Statistics for Arkansas,* Southern Forest Experiment Station, New Orleans, La., pages 11 and 12. Between 1936 and 1951, pine saw timber volume in trees 20" DBH and larger decreased from 17 percent to 8 percent, with similar decreases in hardwoods of the same DBH.

timber study,[3] which makes the same long-term assumptions that we do with respect to all forecasts of commodity prices. Briefly stated, these assumptions are: no all-out war during the period for which we are at risk, but continuance of present high levels of military spending; no radical advances in technology increasing productivity at a higher rate than in the past; less fluctuation of the business cycle in the future than in the past 25 years; and finally, the greater economic stability will be accompanied by high, but not full, employment.

The Stanford study emphasized the likelihood of moderate ups and downs in future business activity. This we believe is a necessary condition if we are to avoid continuing inflation. In making long-term timber loans we must recognize this probability and establish a level of values and approve loan amounts that will not be too difficult for borrowers to carry through business recessions.

As a result of our analysis we adopted a stumpage price level for loan purposes of about 60% of the 1952 price level for southern pine saw timber and about 75% of the same level for pine pulpwood. A somewhat different basis is used where a loan is made to a timberland owner with an established national credit rating, such as a paper company.

When we made this decision neither the Stanford report nor the more comprehensive but still preliminary "Timber Resource Review"[4] of the U.S. Forest Service was available to us. The price level we set is perhaps too conservative in view of the developments since then. However, there are risks arising from appraisal errors, management deficiencies, natural hazards and other changes which, in our opinion, warrant a carefully considered approach.

I have previously mentioned the fire risk, but I am sure that it remains the number one question in your minds. Although we had already satisfied ourselves on this question before entering the field, a couple of years later when the New York Insurance Department conducted its regular examination it expressed concern that policyholders' funds might be lost as a result of the lack of fire insurance on investments in forest properties. After some discussion, the examiners finally recommended that we reexamine our decision to make timber loans. About that time serious fires broke out in southern Georgia in the general region of the Okefenokee Swamp. They received a lot of attention in newspapers, news reels, television and radio, creating considerable uneasiness among our officers and directors.

We had already written to major pulpwood producers and paper companies operating in the South, to state forestry officials, to the Forest

[3] *America's Demand for Wood 1929-1975.* Stanford Research Institute, published by the Weyerhauser Timber Company, Tacoma, Washington, 1954.

[4] *Timber Resources Review* (Preliminary), U.S.D.A., Forest Service, 1955.

Service and to our own borrowers in an effort to determine actual experience with fires. However, to gain first hand information, I flew down to the area a day or two after the largest fire was brought under control and took a number of color photographs showing the extent of damage. Several responsible experts were also interviewed. A comprehensive report on the subject was prepared and the photographs shown to members of our Board. The result was that they were all, I believe, convinced we were taking proper precautions to protect Society timber loan investments against loss through fire.

An average of one to two percent of the protected forest area is severely burned annually in the South. The U.S. average from 1947-1951 is .55%.[5] The actual loss is very hard to determine. Authorities admit that the statistics on this subject are grossly exaggerated. The actual annual value loss of merchantable timber is probably in the neighborhood of $2 per $1,000 of value.[6]

If you have ever burned green logs in your fireplace, you know that it takes a hot fire and a long time for one to be consumed. The facts are that forest fires in southern pine seldom get hot enough to kill merchantable timber. Even in a bad fire there is practically no damage to the merchantable trees for saw timber or pulp. Growth is lost and insects are apt to cause damage if the trees are not harvested promptly.

Despite all we may say to minimize the fire risk *on the average*, we must be prepared not for what will *probably* happen to an individual security, but rather what could *possibly* happen. Moreover, each loan must stand on its own feet. There is not sufficient margin in the interest rate to warrant assuming a possible loss on any individual security because of fire. For that reason, fire risk must be appraised for each case and the loan amount and terms tailored to fit the situation. Fire will destroy the young growing stock. This, of course, is a tragic loss. Therefore, unless the security is separate into a number of isolated tracts, the young growing stock must largely be omitted from any consideration for loan purposes, and the loan must be made on such a basis that in the event of a serious fire we would be paid off from salvage and remaining land value.

My discussion of the fire risk and measures to protect us against it is not intended to apply to the Northwest where we are now making our study of hazards.

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[5] *The Effectiveness of Forest Protection.* American Forest Products Industries, Inc. '52 Ed.

[6] *The Challenge of Forest Fire Insurance.* Monthly Review, Federal Reserve Bank of Boston, June, 1954. The FRB writer estimated an annual loss of $2.50 per $1,000 of value, which the writer has reduced to $2.00 per $1,000 after reviewing the basic statistics on forest fire occurrence.

Time does not permit a discussion of forest fire insurance, which is slowly getting underway in this country. Since the type of insurance presently being written does not insure young growing stock in the South except in plantations, and we are protected by salvage of merchantable timber, we feel it is not necessary for our protection.

I have also referred to the job of estimating timber volumes in making timber loans. Equitable spent considerable time reviewing various forms of timber inventory or cruise reports and the manner in which they are produced. Preparation of a timber inventory is a rather large-scale statistical project. The sampling process involves stratification of the forest into the apparent forest-type areas identified by species and volume density on the basis of stereoscopic examinations of aerial photographs. Data collected by the ground crews in these various strata are entered on tally sheets which are later tabulated and summarized. The mass of detail assembled in the field is amazing. For example, if four different species or groups of species are tallied, each by two quality grades, each of those by four defect classifications, by two inch diameter classes up to 36 inches and by number of log lengths, a single tree will be tallied in one of 2,720 spaces. Of course, this information must be condensed and summarized in order to be useful but we think it is important to preserve the data by local identifiable geographical areas for use in appraisal and management.

An exhaustive study was made in an effort to work out a simpler method of processing this volume of data, preserve the essential detail and yet produce the kind of report desired without undue cost. We experimented with punch cards, mark-sensed in the forest and processed on our machines. It is possible that the new electronic computers would be practical for this purpose but machines short of those are not the answer, in our opinion. As frequently happens, the enforced discipline of machine programming caused us to analyze the entire process step by step. As a result, we developed a hand method, which appears to be a substantial improvement over the present methods we have observed. I shall not burden you with the details, but the method utilizes strip-form tally sheets which are shingled on a peg bar so that summary information can be produced without recopying great masses of figures.

Tree growth is a fascinating subject to me as a layman. There is no question but that a competent forester can determine growth quite accurately. Although growth may vary widely from tree to tree, from one diameter group to another and among species, growth data, properly prepared, provide the basic information the forest manager can use to determine where cutting and improvement work should be carried on to best advantage.

Volume growth is often 10%, 15% or 20%, or even more on smaller trees,

while large matured one may be growing only one or two percent. But volume growth is not the whole answer. We all know that, up to a point, timber becomes more valuable as it increases in size. Unit logging costs are lower, milling waste is usually less and quality is often higher. A tree, for example, may in the next ten years, become much more valuable per unit of measure because it has passed from the pulpwood stage to the saw timber stage. In the following 10 years it may have even greater unit value because of improvement in quality. This can be reflected in growth by developing a value curve continuing from the smallest to the largest merchantable sizes that are applicable to the particular species and local forest area. The product of the present volume growth and the unit value gives value growth. This may be expressed in dollars or as a present annual percentage rate for each size and quality. With such information the problem faced by the manager who wants to maximize income is to remove that volume which is growing at an unsatisfactory value rate and which cannot be increased economically by silvicultural practices and to carry on such other timber stand improvement work on the property as in indicated. From the standpoint of return on capital value, consideration must also be given to the value of the land itself, since that production factor is not growing. It is, in fact, a burden on the indicated timber growth. This type of analysis is back of many decisions to harvest large or valuable timber not growing at a rate that will produce a reasonable return on its sale value.

Growth and income predictions are important to the lender, not only for purposes of determining debt-paying ability in a sustained yield forest, but also for preparation of proper timber release provisions including the amount of timber that may be released in consideration for payment of interest and regular amortization. We sometimes require early liquidation of timber not growing at a satisfactory rate in order to reduce the loan while prices are favorable. Of course, if the loan is sufficiently well secured, we do not care how long timber is left standing just so it is not allowed to deteriorate from old age.

A forest, therefore, may be looked upon either as a warehouse full of inventory or as a field growing a crop. A loan on old, mature, slow-growing timber is an inventory loan, and little else. It can be paid only from liquidation of the inventory. But a loan on a growing crop is paid from periodic harvests and the security will probably be better when the loan is paid in full than when it was made. There are also combinations of the two. They are the ones that require most careful analysis and capable management. We make loans on both kinds and on the combination, but we much prefer the sustained yield type of security.

I turn now to the appraisal process. The forest appraiser's job is essen-

tially one research project after another. He has to organize his thoughts and procedures, dig out the essential facts, sort them in a systematic manner and then present them in an orderly, intelligible report summarizing his findings. As every research man knows, this is easier said than done.

The first step in the appraisal process is an examination of the applicant's financial condition. If that is unfavorable, we need go no further.

The appraisal of the timber and timber lands may be made before or after a detailed timber inventory by an outside consultant is prepared. In either event the forest appraiser is expected to form his own judgment of the value of the property based on an ocular estimate of the volume by forest-type areas, the quality, logging conditions, and hazards. Some folks appear to think that if you have a timber cruise all you have to do is multiply two times four to obtain the appraised value. This is by no means true. Volume is only one of the factors affecting value. If it costs as much to bring the timber out as it will sell for as logs at the roadside, obviously the stumpage has no value regardless of the volume.

The forest appraiser also checks the soils using a soil auger as needed. We are dealing with a crop and soils are as important here as in other types of farming. He also bores many trees to observe the growth history and the effect of past management practices.

The hazards to which the property is exposed must also be reflected in value. Fire, disease, pests, windthrow and trespass are the important ones.

The appraiser then checks his estimate of volume and quality against the inventory report and makes adjustments in either according to his best judgment.

Value is not made by an appraiser. It is made in the market place through sales and purchases. Therefore, before he can settle on an appraised value the appraiser has to find out what similar properties have sold for in the past and are selling for now. This will include prices of land, land and timber or stumpage. Since no two properties are alike he must do some interpolating. However, having obtained a good knowledge of what is on the property to be valued and by observing a number of surrounding sales, he can determine fairly accurately the price for which the subject property would sell. That is its present market value. The appraised value for loan purposes may be more or less, depending on how the lending institution views future prices, and on the terms of any long-term lease or cutting contract which the owner may have with a company having a substantial credit rating.

It is also necessary to review current operations in the area to deter-

mine how logging contractors, mill operators and others affected are making out on the present prices of lumber and determine what they could pay for stumpage with substantially lower product prices.

We often find that very large properties with heavy inventories sell for what appear to be a low price based on present values for stumpage and land. Upon further consideration, however, of the time that it will take to harvest the large timber and the resulting damage to young growing stock, as well as the time that it will take to produce another crop, the price may actually be high. Take for example a property with $20,000,000 worth of large mature timber based on present stumpage prices. If no more than $2,000,000 of it will be harvested each year, we must determine the present value of an annuity of $2,000,000 for ten years. At five percent interest this is $15,440,000 instead of $20,000,000. The appraised value therefore cannot be more than $15,440,000 assuming no growth and neglecting land value.

Loans are made at 5 to 6% interest for terms of 20 to 30 years on either constant or diminishing payment amortized plans with flexible provisions for cutting and prepayment.

We do not attempt to finance the small timberland owner, i.e., where the present market value is much under $50,000. A few exceptions are made in areas where we have other loan business to share the overhead and other costs. Any timber loan has to be watched rather closely to protect against unauthorized cutting and poor management. There is usually more of such risk in small tracts than in large ones. These hazards, together with the rather substantial initial cost of making a timber loan not only make the small ones unprofitable as investments, but often downright hazardous. Our basic measure of the minimum size of security is whether or not it is adequate to sustain capable management. A small tract with a value of $20,000, for example, may produce an average annual income of $1,000 to $1,500 but at irregular intervals. That return will not keep good management interested. Furthermore, small tracts are generally the poorest managed. Where these timber-growing enterprises are combined with a successful farming or ranching enterprise, the situation is quite different. We look upon such combinations as good security for loans and make a substantial number of them in the South.

As I see it, there are two possible solutions to the problem of financing owners of small tracts of timber. Forestry consulting and management firms are in position to manage small tracts in the area where they operate. If they obtain a long-term management agreement covering the land and have the funds, I see no reason why they cannot advance money to the landowner for timber stand improvement or for necessary expenses in holding desirable growing timber. These advances, should, of course,

be secured by a first lien on the land and timber and should bear an interest rate somewhat higher than is charged on the larger deals. The consulting firm can protect itself against most of the risk referred to above because it is there on the ground. Furthermore, it should know the real worth of the timber. The liens could perhaps be pledged with a trustee as security for additional funds for further activity. This kind of adjunct to consulting firms' services could increase the scope of their operations and earnings. The secondary lender, or wholesaler of the money, would rely not only on the pledged liens, but also on the original investment of the consulting firm and its agreement to manage the land.

The general situation today is that management firms have the technical knowledge for making and looking after small timber loans, but lack the funds to advance to their customers. The opposite is often true of the smaller country banks. They have the funds but may be lacking in the timber "know-how." If the country banker could be shown how to recognize the value of standing timber, he is perhaps in the best position to handle these small loans. By way of analogy, banks in the range and livestock feeding sections of the nation customarily finance cattle production secured by chattel mortgages on the growing cattle. Is it not just as conceivable that a banker could learn to recognize the value of 1,000 or 5,000 standing trees, secure the loan by a mortgage on land and timber, and do just as good a job as he does in financing growing cattle? I am a cattleman by background, but I must say that a loan secured by good growing merchantable timber, properly appraised, should be a safer loan than one secured by growing cattle. The national banking act was recently amended to permit timber loans by banks, but such loans are not yet being made in any great volume. Many bankers have made loans to timberland owners for a long time. They were actually backed up by the timber but, for legal purposes, were otherwise secured.

In my opinion timber loans by banks should usually be made only to meet emergency situations with the prospect of early repayment from other sources. The timber should be thought of as a reserve fund. Otherwise, the result is apt to be a premature harvesting of growing trees the next time the borrower needs money.

I think that if we are patient, we shall see much development in the small timber loan field in the next few years. The need for such financing is not so urgent as to warrant creation of a special governmental organization to supply this type of credit. If that were attempted, I am confident the sponsors would be disappointed on its net effect on timber production.

Possibly an enterprising team consisting of a local forestry management firm and his country banker will join forces somewhere and show us how

the technical knowledge and assurance of good management by the forester and the money and financial know-how of the local banker can be combined to meet the credit and timber management needs of the small owner. I should like to see that happen.

There are many more aspects of this timber loan business I should like to discuss with you if time permitted. In summary, however, I shall say that although it is in its infancy, lenders in the field are making progress. The volume of acceptable loan business available is low and the costs of processing it are high. So far the money expended has largely been an investment in the future. We think, however, that it is a worthwhile endeavor and that it will eventually be profitable to the institutional investor that properly prepares itself. And the effect should be of considerable benefit to timber producers and the national economy.

FINANCING FARM ADJUSTMENTS

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IN APPROACHING this subject, I suppose we should define what we mean by "farm adjustments." Obviously, the term applies to radical changes in types of farming, such as a shift from cash crops to dairy, beef, or poultry production. But it may also be applied, I believe, to other developments in agriculture, such as the shift from animal to machine power, the growth of part-time farming, alterations in the number and size of farms, the increased use of lime and fertilizers, and changes in numbers of livestock and acreages of crops. In any event, I shall use the term in its broadest sense and apply it to all changes in methods, systems, or scales of farming.

Most studies of farm adjustments have been concerned either with the changes that farmers have made, or with the changes they profitably could make, in their farming operations. In some studies, the additional capital required to make desirable changes has been computed, and the effect of these changes on farm income has been estimated.[1] But few studies have been directed specifically toward the way in which the farm adjustments already accomplished have been financed, the sources

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[1] Among the more recent studies of this type are the following:

(1) *Possibilities for Increasing Production and Incomes on Small Commercial Farms, Southern Piedmont Area, North Carolina,* by J. Gwyn Sutherland and C. E. Bishop, North Carolina Agricultural Experiment Station, Technical Bulletin 117, December 1955 (Production Economics Research Branch, Agricultural Research Service, cooperating).

(2) *The Business Side of Producing Beef Calves in the Piedmont Area of South Carolina,* by Charles P. Butler, South Carolina Agricultural Experiment Station, Bulletin 426, July 1955 (Production Economics Research Branch, Agricultural Research Service, cooperating).

(3) *Financing Farm Adjustments in the Southern Piedmont,* by Julian H. Atkinson, Farm Credit Administration, Bulletin CR-7, August 1955 (Indiana (Purdue) and Georgia Agricultural Experiment Stations cooperating).

(4) *Increasing Incomes Through Farm Adjustments in the Grenada-Loring Soil Association Area of Southern West Tennessee,* by Thomas J. Whatley and Samuel W. Atkins, Tennessee Agricultural Experiment Station, Bulletin 244, December 1955 (PERB, ARS cooperating).

(5) *Costs and Returns for Soil-Conserving Systems of Farming on Ida-Monona Soils in Iowa,* by Ross V. Baumann, Earl O. Heady, and Andrew R. Aandahl, Iowa Agricultural Experiment Station, Research Bulletin 429, June 1955 (PERB, ARS cooperating).

(6) *Adjusting to Irrigation in the Loup River Area in Nebraska,* by Karl Gertel, J. W. Thomas, T. S. Thorfinnson, and H. W. Ottoson, Nebraska Agricultural Experiment Station, Bulletin 434, February 1956 (PERB, ARS cooperating).

(7) *Irrigated Farms in a subhumid Cotton Area,* by O. J. Scoville, J. C. Atherton, R. O. Rogers, and K. C. Davis, U.S.D.A. Circular No. 980, May 1956 (Oklahoma Agricultural Experiment Station cooperating).

and terms of the credits used in making these adjustments, or the financial factors that may be impeding the further adjustments needed on many farms.

Perhaps the most useful thing I can do in this paper is to bring together some bits of information that bear on these subjects and to express my own impressions of their meaning. Let us begin by considering some estimates of the expenditures made, and the credit used, by farmers since the end of World War II.

Farm expenditures and farm credit. From available statistics, it is possible to develop a fairly clear picture of expenditures in the farm sector of the economy. From 1946 through 1955, farmers and other owners of farmland apparently spent approximately $363 billion. This estimate takes account of gross cash farm income, the income of farmers from nonfarm sources, the cash savings of farmers, and the net increase in farm debt. So far as landlords are concerned, it includes expenditures equal only to their farm rentals and the net amount that they borrowed on agricultural loans. Of the total amount, about $155 billion were spent for operating purposes, about $135 billion went for living and nonfarm purposes, and about $73 billion went into farm capital goods and farm real estate.[2]

These figures give a general idea of the magnitude and nature of expenditures. They can be compared with some estimates, that I have made, of the amount of credit used in the farm sector. However, the data on farm expenditures are not strictly comparable with the data on credit; they omit transactions within States among individual farmers for which credit is often used.

The credit used in the farm sector during this period appears to have been about $125 to $130 billion or about one-third of the expenditures noted above. Of this amount, about $11 billion was farm-mortgage credit, including sales contracts, and the rest—$115 to $120 billion—was non-real-estate credit, including open accounts and installment contracts. These data exclude price-support loans and loans made to renew or refinance existing debts. It appears that $90 to $95 billion of the non-real-estate

[2] Most of the data used in making these computations were obtained from *The Farm Income Situation*, July 1956, and from the *Balance Sheet of Agriculture* for various years. Both are publications of the U. S. Department of Agriculture. However, an independent estimate was made of the cash savings of farmers, exclusive of interest accruals; and unpublished data on shipments of dairy and breeding cattle were deducted from production expenses and added to expenditures for capital goods. Also, automobiles have been entered as capital goods at full value rather than at the 40 percent of value ordinarily used. Farm real estate transfers have been entered at the transfer price, even though some buyers assumed mortgages on the farms they bought. These latter methods do not affect the amount of total expenditures. They merely cause the amount of expenditures ascribed to living and nonfarm purposes to be less than it otherwise would be.

credit was paid within 12 months after it was extended. Some of the mortgage credit also was paid within a year. Probably the total amount of credit that remained outstanding for more than a year—which we may call intermediate- and long-term credit—did not exceed $30 to $35 billion. The increase in farm debt during the 10-year period, excluding price-support loans, was only about $9 billion.

Any of you who may have tried to make similar estimates will be aware that these estimates involve a great deal of guesswork. However, I am satisfied that the amounts of credit used in the farm sector during this period could not have exceeded by much the amounts estimated. Thus I am confident that not more than about a third of the farm expenditures during 1946-55 were made with borrowed money or other credit. Without doubt, non-real-estate credit was used predominantly.

If all the credit that was paid within a year had been used for current operating and living purposes, and all that was extended beyond a year had been used to buy capital goods and farm real estate, we could say that somewhat less than a third of the expenditures for operating and living purposes, and perhaps as much as 40 to 50 percent of the expenditures for farm capital goods and farm real estate had been made with credit. But inferences from the data cannot be stretched that far. Many credits for operating and living purposes extend beyond a year and many of those used to buy farm capital goods are paid within a year. Scofield's data on farm transfers indicate that the mortgage loans and sales contracts arising from sales of farm real estate amounted during the period to only about a third of the value of the farms sold.[3]

The estimates cover expenditures, and credit used, for ordinary operations and capital replacements as well as those for making farm adjustments. Whether credit was used more, relative to expenditures, for making farm adjustments than for other purposes is not known. Most model plans for adjusting farm enterprises call for the investment of additional capital by the operator. Sometimes the additional capital needed exceeds the amount of capital an operator has invested. To make such adjustments in a short period, many farmers presumably would need to borrow a large part of this additional capital. But that is true also of farmers who merely replace a tractor, truck, or automobile, and who fail to save the money needed before they make the purchase. My impression is that most farmers have worked gradually, rather than abruptly, into an adjusted system of farming. To the extent that this is true, farm adjustments probably have required little, if any, more credit, relative to ex-

[3] *Current Developments in the Farm Real Estate Market,* Production Economics Research Branch, Agricultural Research Service, March 1955, page 22, and July 1955, page 16.

penditures, than have the ordinary operations and the capital replacements made by farmers.

Reasons for sparing use of credit. Assuming that only about a third of the expenditures for farm adjustments in the 10 years following the war was made with borrowed funds, one may ask why no more credit was used. The answer would appear to lie in one or more of the following possibilities: (1) Farmers had ample income and other current funds to make most of the expenditures for such purposes that they desired to make; (2) lending institutions were reluctant to extend credit to farmers; or (3) farmers were averse to borrowing.

With regard to the first possibility, none of the available data indicates how large an investment farmers would have liked to make in farm adjustments, but it is known that farm income was exceptionally high during this decade, despite the decline in recent years. Moreover, the income of farmers that was available for living purposes and for investment was considerably greater than the realized net income of farm operators from farming. That is because depreciation and other capital consumption allowances are deducted from gross income in computing net income from farming and because farmers had considerable income from nonfarm sources.[4] Whereas the realized net income of farm operators from farming averaged $14.1 billion during 1946-55, the income of farmers that was available for living purposes and investment averaged $22.3 billion. This latter figure may be compared with $15.6 billion for 1941-45 and $7.9 billion for 1936-40. Also, it is known that many individual farmers invested during this period sizable financial reserves that they had accumulated during the war.

As to the second possibility—that lenders were reluctant to extend credit to farmers for farm-adjustment purposes—again no research data are available. However, it is common knowledge that lenders were in active competition for acceptable farm loans throughout this period, and that they are still making a large volume of loans to farmers. Appraisals of some lenders were not increased as rapidly as farm real estate value rose; some applicants for credit undoubtedly did not receive as much as they wanted; and loans to many farmers have been restricted in areas affected by extreme drought. But these are mostly adaptations of credit to individual situations. They cannot be taken to reflect a general reluctance of lenders to finance farm operations or farm adjustments. However, many lenders believe that usually it is best for farmers to work gradually and experimentally into a system of farming that differs greatly from the one to which they are accustomed. This may have curbed the use of credit for adjustment purposes by some farmers.

[4] "Trends in Capital Formation and Financing in Agriculture," by Alvin S. Tostlebe, *Journal of Finance*, May 1955, page 242.

As to the third possibility—that farmers were averse to borrowing in order to make farm adjustments—data from several studies suggest that this may have been an influential factor.[5] The reluctance of farmers to use credit for farm adjustments apparently stems, to a large extent, from other considerations. These include their uncertainty as to future prices and yields and as to their ability to succeed at a different type of farming; their unwillingness to adopt systems of farming that would require them to perform tasks such as milking cows or caring for beef cattle; and tenure arrangements or plans for the future that give them little interest in possibilities for long-run gain compared with their interest in immediate income. The age and health of the farmer are factors in all of these considerations. However, farmers probably are willing to make many investments from current income or savings that they would be unwilling to make if they had to borrow the necessary funds.[6] This is more likely to be true of farmers who have reached a comfortable financial position and who are well along in age. Many of these farmers apparently do not want to risk impairment of their present security on the chance that a change in farming methods will pay better than the methods they are following.

A notable area in which farmers currently show an aversion to the use of credit is the commercial broiler industry. During the war, when remunerative prices for broilers appeared to be assured, a large proportion of the broiler growers used credit in their operations. Most of it was obtained from dealers on open account. But in recent years, growers have become wary of credit. More and more they have demanded, and obtained, contracts from dealers under which the dealers assume all credit obligations and risks of the enterprise. In these contracts, the grower receives for his labor and capital a stipulated payment, a share of the net proceeds after deduction of direct supply costs, or a combination of the two. These arrangements are often called credit contracts but in reality no credit is involved. They are either labor contracts, as with contracts that involve a flat fee or feed-conversion payment, or joint ventures with a stop-loss arrangement for the grower as with the commonly used share contracts.

In my opinion, most farmers, except those with very low incomes, can obtain all the credit they are willing to use for making farm adjustments.

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[5] *Obstacles to Conservation on Midwestern Farms*, North Central Regional publication No. 28, Missouri Agricultural Experiment Station, Bulletin 574, June 1952, p. 9; *Some Obstacles to Soil Erosion Control in Western Iowa*, by John C. Frey, Iowa Agricultural Experiment Station, Research Bulletin 391, October 1952, p. 966 (Bureau of Agricultural Economics cooperating); and *Using Credit for Farm Adjustments in the South*, Farm Credit Administration, Research and Information Division, November 1955, p. 6.

[6] *Resource Productivity in Iowa Farming*, by Earl O. Heady and Earl R. Swanson, Iowa Agricultural Experiment Station, Research Bulletin 388, June 1952, pp. 769-770.

Only about 30 percent of the farms are mortgaged and, of those mortgaged, relatively few are mortgaged for a high percentage of their value. Moreover, a number of studies have shown that a large proportion of farmers either have no debts or debts that are small in relation to their assets.[7]

Areas of credit difficulty. We should not conclude from this that there are no serious credit obstacles to the achievement of desirable adjustments on farms or that arrangements for financing farm adjustments are not in need of improvement. Let us see if we can identify the areas in which either insufficient credit, or unsatisfactory terms of credit, may impede desirable farm adjustments. Perhaps we may gain also some insight into the nature of the improvements in credit facilities and practices that are needed.

Obviously, the farmers who would have most difficulty in obtaining sufficient credit for adjustment purposes are those who already are indebted heavily in relation to their assets and incomes and those whose incomes are so low that lenders doubt their ability to pay debts in addition to necessary living expenses. Because of their heavy debts, or low incomes, these farmers have more pressing need than many others to make changes that would improve their incomes. Yet neither they nor the lenders from whom they may request credit can be certain that the adjustments proposed would increase their incomes sufficiently to justify the risks involved. On loans to these farmers, the lender as well as the borrower might suffer considerable loss if the adjustment should not work out as hoped or expected.

It is suggested sometimes that lenders should consider proposed land improvements and anticipated increases in income in appraising farms for loans. I am in favor of this but I can understand also that a bird in the hand provides more security to a lender than does a bird in the bush.

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[7] Among such studies are:

(1) *Financial Structure of Virginia Agriculture,* by Fred L. Garlock, Malcolm E. Wallace, Russell W. Bierman, and Harry M. Love, U.S.D.A. Agricultural Information Bulletin No. 97, February 1953, p. 40 (Virginia Bankers Association, Federal Reserve Bank of Richmond, and Virginia Agricultural Experiment Station cooperating).

(2) *Financing Vermont Dairy Farms,* by Robert P. Story, Vermont Agricultural Experiment Station, Bulletin 571, August 1953, p. 17.

(3) *Broiler Production in South Carolina,* by James F. Miles and J. Verlon Minchew, Agricultural Experiment Station, Clemson Agricultural College, Bulletin 415, January 1954, p. 13.

(4) *Maryland Farmers Look at Social Security,* by Paul R. Poffenberger, Maryland Agricultural Experiment Station, Bulletin 446, January 1954, p. 32.

(5) *Credit Sources, Practices, and Opinions of Pennsylvania Farmers,* by L. F. Miller and F. A. Hughes, Pennsylvania Agricultural Experiment Station, Bulletin 514, June 1949, p. 3.

(6) Also, see Heady and Swanson, *op. cit.,* footnote 6, p. 775.

Commercial and even cooperative lenders undoubtedly could go further than they usually do in the high-risk areas of adjustment credit if they would work more closely with farmers in analyzing and appraising adjustment plans. I hope for progress in this area. But it still seems probable that many farmers in the high-risk groups will require help from relatives or from the Farmers Home Administration, at least in the initial stages of their adjustment programs. Even the Farmers Home Administration must confine its loans to those who appear to have the ability and drive to make the adjustments succeed.

As we pass from the high-risk areas of adjustment credit to areas that involve moderate to low risks, the problem changes. It becomes less a matter of obtaining sufficient credit and more a matter of obtaining credit on suitable terms. Farmers who are able and willing to provide adequate real estate mortgage security have no problem on either score. They can obtain mortgage credit from one lender or another at moderate rates of interest for such periods as they desire. Also, for the most part, they are permitted to make payments on principal at any interest payment date. But it is probable that many farmers who are able to give adequate real estate mortgage security, prefer to use non-real-estate credit. Moreover, about a third of the debt-free farms are operated by tenants. So far as tenants may desire to borrow for adjustment purposes, they necessarily must use non-real-estate credit.

In any event, non-real-estate credit is the type of credit most used in making farm adjustments. It is also the type of credit on which suitable terms for financing farm adjustments are most difficult to obtain. A great part of the non-real-estate credit extended to farmers is made callable in less than a year, whereas credit for making farm adjustments often is needed for several years. Although lending agencies usually renew the amounts that borrowers find it impossible or inconvenient to pay, under this system lenders retain the legal right to demand payment when the loans are due.

Whether this short-dating of loans discourages many farmers from undertaking adjustments they would make otherwise is debatable. One's natural impulse is to assume that it would be regarded as an obstacle by farmers; but a study made by Lawrence Kreider several years ago indicated little objection to the practice on the part of members of production credit associations.[8] This subject should receive more study.

But regardless of what more study might reveal, in my opinion loan terms should be adapted more closely to borrowers' circumstances and needs. In times like the last 20 years, when lenders have been under no

[8] *Farmers' Needs For Intermediate-Term Credit*, by Lawrence E. Kreider, Farm Credit Administration, Bulletin CR-6, October 1954, p. 19 (Purdue Agricultural Experiment Station cooperating).

considerable strain, the existing practice has probably caused little, if any, hardship to farmers. But if lenders should again come under strain, as they have on occasion in the past, it could work great hardship on farmers.

To keep the record straight, let us recognize that intermediate-term loans are now used to a considerable extent in financing purchases by farmers of automobiles, trucks, tractors, farm equipment, and livestock, particularly dairy animals. Unfortunately, payments on these loans too often are fixed in accordance with some stereotyped amortization schedule or some standard percentage of a milk check; whereas the type of loan needed would be based on an over-all analysis of the borrower's financial circumstances, needs, and prospects. But to bring loans of the latter type into common use, a number of changes will be required in the thinking and practices of both lenders and farmers.

Changes required to increase use of intermediate-term loans. One gets a variety of answers when he inquires into the reasons of lenders for placing so many of their non-real-estate loans on a short-term basis. Many bankers relate the practice to the fact that their deposits are payable on demand. Other bankers and some of the farm credit people regard it as desirable because it permits a periodic review of the loans and protects the lender against loss. In these days, virtually all banks carry sufficient primary and secondary reserves to meet any shifts in deposits that are likely to occur. Therefore, it seems archaic to regard short maturities on adjustment loans as necessary because bank deposits are payable on demand. There is more justification for the view that they may be needed to protect the lending institution against loss. The justification arises mainly, I believe, from the following practices of borrowers and lenders.

First is the practice of "split" financing. Many farmers finance an automobile here, a truck there, a tractor some place else, and get cows on credit from livestock dealers. They go to the financial institution for a cash loan. It is no wonder that the financial institution requires such security as the borrower can give. Nor is it any wonder that the financial institution places a short maturity on the loan so that it can have frequent opportunity to collect any free money the borrower may have. Each creditor must look out for himself when this practice is followed. Until farmers who follow such practices concentrate their borrowing at one place and keep within spending budgets agreed to by the lender, it is futile to expect that sound financing plans can be developed for them.

Second is the practice of "piecemeal" borrowing. This is the practice of financing one purchase or step at a time. To the extent that farmers think of only one step at a time when they move into an adjustment program, or desire to take only one step at a time, they may need only short-term credit; and losses may develop if lenders do not collect loans when

borrowers are able to pay. But it is clear, from a number of cases that have been discussed at farm credit conferences, that farmers often arrange for their financing on this basis even when they have long-range plans. This practice makes it difficult for the lender to determine what the borrower is trying to accomplish. Often the lender gets no inkling of the borrower's long-range plans until a renewal is requested and then he gets only a picture of the next step the borrower proposes to take. Until farmers develop long-range plans and take lenders fully into their confidence, it will be difficult for lenders to use better methods in financing them.

But let us not get the impression that all of the shortcomings are on the part of farmers. Many lenders find it easier and safer to buy farm paper from merchants and dealers than to finance farmers directly. This encourages, and in some instances, forces farmers to do the split and piece-meal financing described above. Lenders also find it easier to lend on security and to use short maturities or a standardized amortization schedule than to analyze a farmer's situation and prospects or to appraise a plan for improving his system of farming. Until lenders are more generally willing to analyze the borrower's present and prospective repayment ability, and to use repayment ability as the main base for credit extensions, with formal security as a supplemental protection, farmers are not likely to get legal terms of loans that are suited to their needs for many adjustment purposes.

I do not want to create the impression that all farmers borrow piece-meal, split their financing, and fail to take lenders into their confidence; or that lenders do not go thoroughly into the situations and plans of some of their farmer borrowers. But the shortcomings noted are widespread enough that they should be recognized as important obstacles to the use of intermediate-term loans in agriculture.

Closer cooperation between lenders and farm borrowers, and more careful analysis and planning by both, would improve greatly the basis on which farm adjustments are financed. If credit terms are to be "tailored" to farmers' needs, farmers must develop plans that lenders can analyze and appraise and they must be willing to hold their expenditures and debts within limits agreeable to lenders. Lenders, in turn, must rely less on formal security and statements of net worth and more on analyses of the present and prospective earning capacities of farmers. If farmers and lenders would unite in making these improvements in their practices, it would not be difficult to develop contracts for intermediate-term loans that would protect the interests of each. The need for such improvements may be expected to increase as time goes on, as farmers probably will require more credit, relative to their expenditures, in coming years than they have in the last ten years.

In closing let me refer to several recent developments that hold promise

of improvement along the lines we have been discussing. About two years ago the Farm Credit Administration, which previously had made most of its loans for farm adjustments as well as other purposes payable within a year, launched an experimental program of making some loans for longer periods up to three years. Recently, I was informed that more than 5,000 loans totaling nearly $15 million had been made under this program. These loans were made in 26 States and in Puerto Rico. If the experience with these loans is favorable, more loans probably will be made on this basis. Second, last fall all of the federal bank supervisory agencies called the attention of their examining staffs to the fact that no regulation or provision of law prohibits the extension of intermediate-term loans to farmers, provided such loans meet the usual standards of sound credit. This action was publicized, and it may help to break down some mental blocks against the use of intermediate-term loans in agriculture. Third, the American Bankers Association has been canvassing banks concerning their experience with, and their attitude toward, intermediate-term loans to farmers. I understand that some members of the association have advocated the use of such loans when circumstances warrant. The interest currently focused on this subject seems certain to lead to progress.

EQUITY FINANCING IN AGRICULTURE

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MODERN farming in the United States is a capitalistic type of production. On successful operating units in commercial areas, the investment per man is $20,000 to $30,000, yet an owner operator is expected to furnish all of the risk capital he uses. He must borrow the remaining amount needed at fixed rates of interest, and on terms that relieve the lender of most of the risk of financial loss. In other words, an owner operator must supply at least 35 to 50 percent of $20,000 to $30,000 for each man employed in his business, and get from 50 to 65 percent from loans that bear fixed rates of interest. A tenant operator can get control of land and, in some instances, a part of the working capital through a lease. By this procedure he has access to risk capital, but the combinations of economic factors made available to him under customary contractual arrangements often are far below the optimum required for a high level of efficiency in producing and marketing farm products. These conditions merit careful inquiry. My purpose is to call some of the problems created by these financial maladjustments to your attention and to suggest a solution for them.

Agriculture today has many of the characteristics of a pioneer industry in a modern economy. During the period of settlement, farming was a way of life. The grubbing hoe, the axe, the one-shovel or double-shovel plow and the two-man saw were standard tools. Very little labor-saving equipment was used. The size of farms was adjusted to this level of technology. Investment per man was low. A young man who wanted to set up his own business easily could acquire enough capital to qualify for a low-risk or no-risk loan. Production was largely for consumption in the home or in the local community. If the family had shelter, food and clothing, the farmer was a successful operator.

The situation today is far different from that faced by the pioneer farmer. Commodities are produced in volume for market by using complex equipment. At first the change from subsistence to commercial farming was slow. In recent years progress has been accelerated. The changes that have taken place in the years since 1930 are striking enough to be described as a technological revolution. Within this 25-year period, replacement of horses and mules with tractors has been completed in the commercial farming sections. Plant breeders have given us hybrid corn and higher yielding varieties of other crops. Now crops such as lespedeza, soybeans, brome grass, ladino clover and fescue have come into general use. Chemical fertilizers have supplemented or replaced legume crops and barnyard manure in the quest for higher yields per

acre. Scientists have learned to establish and maintain optimum levels of plant nutrients in soils. They have found that worn-out land can be restored and made more productive than it was when cleared of timber or broken from the native sod. Irrigation has been moved from the arid west into regions of thirty or more inches of rainfall. The chemist has expanded his field of investigation to include the farm as well as industry and has found effective procedures for controlling weeds, insects, and many plant and animal diseases. Antibiotics and hormones have improved efficiency in the use of feeds for livestock production. The engineer has developed new types of machinery, and electricity has taken the drudgery out of milking, feeding, barn cleaning, and a myriad of other chores.

These developments have increased the investment required for a successful farm business and have multiplied the risk of financial loss when a high proportion of the money is borrowed. To a large extent, mechanization has freed successful farm operators from dependence upon hired men, but it has increased the capital outlay for machinery. Dr. Howard G. Diesslin points out that machinery and motor vehicles made up 6.5 percent of the total investment in farm businesses in 1940 and 12.5 percent in 1954.[1] Today it takes $20,000 to $25,000 to outfit an efficient-sized commercial farm with working capital. The operator will need $10,000 of his own money to qualify for a line of credit that will complete this requirement. If he wants to start as an owner operator, he will have to have at least $20,000 additional money for a 35 percent equity in the normal agricultural value of a satisfactory farm, plus the difference between normal value and the current market price. In the good soil areas where drouth or some other disaster has not reduced farm income materially in recent years, this difference often is as much as $100 an acre. A hired man or a man with an ordinary job off the farm will spend many years accumulating these amounts out of earnings. In his study of Farmers Home Administration applicants who did not get loans, Dr. Franklin J. Reiss found that 40 men who were not farming had been able to add an average of $404 to their capital during the year before they applied for the loan.[2] At this rate, more than twenty years would be required to establish a satisfactory basis for credit so a man could take over a good commercial farm under a customary cash and crop-share lease. A start as an owner operator of an efficient farm business

[1] Howard G. Diesslin, "A Re-Examination of the Credit Needs of Agriculture," *Journal of Farm Economics*, Vol. 36, p. 1200.

[2] Franklin J. Reiss, *They Did Not Get Loans*, Research Report Number Four, January 1955, Department of Agricultural Economics, University of Illinois, Urbana, Illinois.

is beyond the life span of these men. These facts and the desire to farm may be the principal reasons for the 2.7 million inadequate farm units that exist today. One million of this number are small, full-time farms, and 1.7 million are small, part-time units. What we have is a land-holding pattern that has been carried over from the frontier days of subsistence farming; a new technology that makes larger acreages and larger flocks and herds necessary in order to get efficient use of land, capital, and labor; and a system of farm finance that restricts adjustments in farm businesses except among those people who have relatively large amounts of money to invest. The farm problem we read so much about these days in the newspapers, see on television, and hear discussed on the radio deals largely with these 2,700,000 small full-time and part-time operators. They are approximately 56 percent of all farmers, but they produce only 14 percent of the national output of farm commodities. The conditions surrounding them are the major reason for the farm problem. They need money to reorganize their businesses, but their incomes are too low to save it. They do not have enough collateral to get adequate loans. Uncertainty of future income makes many of them reluctant to borrow as much money as they can borrow. We can insist that existing credit agencies are supplying plenty of money for everyone who wants it and has a satisfactory basis for credit and, therefore, no problem exists; or we can recognize the fact that the needs of 44 percent of our farmers are met by these agencies, and that a different system of finance is required for the remaining 56 percent.

Let us turn our attention to the problems of the 56 percent. It is impossible for these people to be prosperous and to become good credit risks with the businesses they now operate. Their farms are not large enough to keep modern farm equipment running a sufficient number of days during the year to get low operating costs per acre or per hour, and they cannot produce enough without it to get satisfactory incomes. Until the organization of these small businesses is changed, or these families get relocated in other industries, they will continue to be a credit problem. The businesses they operate are obsolete. Adjustment to the new technology that surrounds them is painful. It cannot be brought about through the use of credit under present rules and regulations governing the operations of institutions that make loans to farmers. The changes that are needed require construction of new buildings and remodeling of old ones for new enterprises. Water control structures and fertility treatments that will cost as much as $60 an acre will be required in many cases to make crop production profitable. Where markets are available, the volume of business can be increased through the use of intensive products such as eggs, broilers, fruits and vegetables. Where markets are

not available, it will be necessary to combine two or more farms into a single operating unit in order to have an adequate business for a family. In either case, the two major problems are: (1) finances, and (2) capable management of the reorganized business.

The existence of this high percentage of low income farms should not be interpreted as failure of existing credit agencies to render the services for which they were created. They are providing funds to the farmers who can qualify for loans under the rules governing their operations; but additional financial institutions are needed to furnish risk capital for adjustment of businesses operated by people who cannot qualify. The corporate form of organization appears to be well adapted to this type of service. Funds for enlarging or combining inadequate farm businesses could be obtained through the sale of common stock. Title to the farm businesses would rest in the financing agency. First consideration would be efficient operating units with enough land and working capital for full utilization of the family labor. Good management would be assured through supervision by well trained managers who would be employees of the corporation. Specialization in this field would require ownership of 25 or more farms in a relatively small area so the manager could see each operator frequently without incurring excessive travel expenses. These farms would be made available to tenants under standard leases that would be adapted to their productivity and the enterprises on them.

The financial structure suggested here would permit the corporation to issue two types of stock—Class A and Class B. Ownership of the Class A stock would represent an equity in the entire firm. The owner of Class B stock would hold rights in a particular farm business owned by the firm. Each tenant would have the privilege of purchasing Class B stock in the farm he operated. When he held enough of it to give him sufficient equity to qualify for a loan from one of the existing agencies, such as a land bank or an insurance company, the corporation would redeem his Class B stock at the market price for Class A shares and he could buy the farm business. This procedure would help a great many farmers to move into the group that have adequate bases for credit. Banks, insurance companies, and the cooperative credit agencies would have more business than they have at the present time, because a greater number of farmers could qualify for loans.

Under this procedure, the corporation would consolidate inadequate farm units; equip the land with water control structures; treat the soils so the operator could get high yields; establish cropping systems suited to the use capabilities of the land; set up livestock organizations based upon the feed supply and the availability of markets; and assist the operator with his management problems. The operator could invest the

money that became available to him through gifts, inheritance, or savings in a well balanced, efficient farm business. It would be financed completely by selling common stock on which dividends would be paid as earnings warranted, not through real estate and chattel mortgages for a portion of normal value, with the owner paying fixed rates of interest and bearing most of the risk of financial loss resulting from violent price declines, drouth, flood, and other disasters. When transferred to the operator or to any other buyer, the entire farm business would be sold as a well balanced unit, not land and improvements as real estate and working capital as chattels.

This procedure would avoid the time-worn practice of having an able operator develop a well-balanced, efficient farm business with a good beef breeding or dairy herd as the major enterprise, then tearing it down at the time of his death or retirement, scattering the herd to the four winds at a public auction, renting the land to a young man with a thin equity in his equipment, or selling it to an operator who is compelled to reduce his working capital to the bare minimum required for cash crop farming in order to pay enough down to qualify for a loan. The farmer himself and society as a whole would benefit from this improvement in allocation of resources.

Numerous examples of corporation owned and operated farms can be found in the United States. In most cases, workers live in company houses and work in crews under the direction of field bosses. This is not the type of organization described here. The primary functions of this corporation would be to furnish risk capital and to help farmers with their management problems. It would place on each of the operating units it owned the optimum amount of capital in the form of land improvements, buildings, machinery, and livestock required for efficient use of labor and the other factors of production. This procedure would reduce operating costs per unit of product and increase net returns. It would correct the two major deficiencies that confront most young men who start farming, i.e. scarcity of capital and lack of managerial skill. In many cases, it would not be wise to take a young man with no experience other than that gained on the home farm and put him in charge of a $60,000 business. He would need to spend some time training for the job. This training could be supplied by allowing him to be a "second man" on one of the larger, well established units for a period of one or more years. He would be an assistant to the farm operator, not a hired hand. During this time he would have an opportunity to get acquainted with the organization and its procedures. The farm manager would have a chance to observe the young man's attitudes, decision-making abilities, and general aptitude for becoming a successful farm operator.

Another service of the corporation would be enlargement of existing

farm businesses. This task would be accomplished by purchasing small or inadequate farms and equipping them for more intensive operation by installing water control structures, treating the soils, remodeling old buildings or constructing new ones, and by combining two or more units where a larger acreage was needed for an efficient business.

Still another service could be rendered in transferring property to the next generation. In many instances, only one member of a family is interested in taking over the home farm. The other heirs want their money. If the one remaining on the farm does not receive a high percentage of the inheritance, he finds himself unable to pay the other heirs and maintain an efficient business. In such cases, the corporation could purchase the entire unit, give the other heirs either cash or shares of Class A stock, and the operator Class B stock for his equity. He could continue to operate an efficient business until he had accumulated enough capital to own it free of debt or with a "safe" loan from one of the existing credit agencies. This procedure would stop the practice of tearing down farm businesses and rebuilding them each generation.

The corporation could aid a farmer who wants to retire by purchasing his farm business for enough cash to permit him to buy a house in town, and giving him Class A stock for the remainder of its value. This arrangement would give him an investment in a familiar business that would profit from superior efficiency in production and management. Upon his death, it would be much easier to divide an estate composed of these stocks than to divide land or a farm business.

The purpose of most of our legislation concerning agricultural credit has been to help farmers become owner operators. Title to the land he farms is the ambition of most farmers. Approximately 2.7 million, 56 percent of the 4.8 million farms in the United States, are inadequate businesses for the support of the families who farm them. The man who is now renting a well balanced unit that gives him an opportunity to use his labor efficiently may be better off to continue as a tenant and put his savings into stock in the corporation or some other investment than to attempt owner operation of one of these inadequate businesses.

Farms owned by the corporation could be made available to operators under specific business agreements. The income that would be divided would be the net after all operating expenses including taxes, insurance, and repairs were paid. Examination of a business in Central Missouri for which there is a continuous record for the years 1946 through 1954 shows that an operator who started with no investment in 1946 would have accumulated $6,300 out of his share of earnings by the end of 1954, after deducting an average of $1,470 a year for family living expenses. The corporation's share of net farm income would have permitted it to

pay 6.2 percent on the total value of the business after deducting 20 percent for overhead and management expenses. Dividends at this rate would be above the average return on investments in industrial stocks and much above the yield on either government or corporation bonds. In a series of bad years, earnings might be lower than returns on these securities, but average yield for all of the years should be higher than bond or mortgage rates. The investor who supplies risk capital demands a high rate of return.

The record used in this analysis was kept by the operator of a 160-acre farm. He did not have enough money to organize and operate the business for highest net income. Returns would have been better under a good system of equity financing, but the results that were obtained indicate what can be accomplished.

At least two major obstacles stand in the path of these new agencies. One is legal, the other financial. Changes in federal legislation would be required to permit the Farm Credit Administration to add an equity financing unit to the institutions under its supervision. Several states have laws prohibiting permanent operation of farms by corporations. These laws would have to be changed. Enabling acts probably would be required in states having no restrictive legislation at the present time.

The barrier of obtaining funds to get started would be difficult to overcome. Any new business must have time to become established and to build good will before investors bid strongly for its stocks. Approximately 50 farms would be needed for full utilization of the minimum staff of an equity financing corporation. An investment of $50,000 per farm would mean a total outlay of $2.5 million. It might be difficult to assemble this amount of money quickly through the sale of stock in an untried corporation. The following procedures are suggested for financing the initial venture:

1. Get one of the foundations to make capital available for a fifteen-year period with repayment privileges at any time. Offer the stock to investors and return the money to the Foundation as rapidly as it could be sold.
2. Have each of fifty life insurance companies that make loans to farmers turn over to the corporation one well-equipped farm near a central office for use during a fifteen-year period. As stock in the corporation was sold, the money could be returned to the insurance companies.
3. Organize an equity financing division in the Farm Credit Administration and finance it out of earnings by reducing cash dividends to members of national farm loan associations and production credit associations. As the operators of the division-owned farms acquired

equities that permitted standard loans, the businesses could be financed through the land banks and intermediate credit banks, and the money used to bring other businesses to a high level of efficiency.

A look at income and operating-cost data from any part of the United States reveals the fact that a great many farm families receive inadequate incomes. One of the principal causes is inefficient combinations of economic factors. It is believed that the situation can be improved materially through the procedures suggested in this paper.

DISCUSSION: ECONOMIC CONSIDERATIONS IN MAKING TIMBER LOANS

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Mr. Ferguson's paper impresses me very favorably with the thoroughness with which The Equitable Life Assurance Society investigates before entering a new investment field. He shows an understanding of forest industry and how it has grown and developed over the years. The variety of production and price hazards has been carefully considered and scientific appraisal and lending methods have been developed. Further, his company shows a commendable caution in slowly expanding its timber loan business, learning from experience as it proceeds.

The approach that the company is taking will be of benefit to timber owners as well as to the organization. In the past, many farm foreclosures and much debt distress have stemmed directly from lenders jumping into a new area or field of investment without adequate experience or preparation. Although timber loans have been made by a variety of lenders from time to time, I doubt if appraisal procedures have been as scientific or exacting as with lending on farm real estate. I expect other insurance companies, federal land banks, and commercial banks will be watching with interest Equitable's activity in the timber loan field.

Ferguson discusses fire insurance to some extent and concludes that it is not necessary for their protection because as written now it does not usually insure young growing stock which is damaged most seriously by fire. Possibly there is need for a comprehensive forest-fire insurance program on a nation-wide basis so as to have a wide distribution of risks. This should do much to lower insurance costs and to encourage ade-

[1] The opinions expressed are those of the author, and do not necessarily represent the views of the Agricultural Research Service.

quate insurance. Such a program would expedite the extension of credit and stimulate the investment of funds into expanded forest output.

Ferguson's paper is mainly concerned with lending by the Equitable. He, of course, does not purport to cover the entire timber credit picture. He indicates loans with terms of 20 to 30 years are available only to those whose timber holdings are worth about $50,000 or more. So far, the company's business has been relatively small. I would like to raise a question as to the importance of this type of lending for our forest industry, as a whole, and what proportion of our timber owners would be eligible for credit from lenders making such loans.

I know of no data that reveal the number of owners with timber holdings worth $50,000 or more, but it is probable they represent a very small proportion of all owners. The U. S. Forest Service reports that in 1953 there were some 4½ million private owners of commercial forests. Eighty-six percent of these owned less than 100 acres of timber; 13 percent, 100 to 500 acres, and only about 1 percent of the owners had 500 or more acres of timber. It is probable that Equitable, in its purely forest program, is mainly aiming at the credit business available from this 1 percent of all owners. In terms of acres, however, this 1 percent owned 39 percent of the entire private commercial forest area. These percentages vary considerably by region with the larger holdings relatively more numerous in the West. Of the private forest area about 46 percent is owned by farmers, 18 percent by forest industries, and 36 percent by other private owners.

There is much equity financing in timber production both by big lumber and paper companies and by small individual owners. Nevertheless, the production of timber requires several kinds of credit and there is room for a variety of lenders. Credit of short term is needed for operating expenses at the time timber is cut and processed. Commercial banks have been best suited to provide this type of credit. In some areas Production Credit Associations have made a few loans for such purposes. It is the kind of credit most readily available. Marketable security is at hand and the repayment of the loan can be easily foreseen.

Longer-term credit for the development and improvement of forest land has been more scarce. Here there are many more uncertainties, risks are greater, and repayment of the loan is much more distant. But as a force in maintaining or improving our forest resources this type of credit is vital. Credit can help in the consolidation of forest land so units will be of more economic size and justify scientific management. Longer-term credit can finance the weeding and thinning of growing timber and the construction of roads and firebreaks. It is also often necessary if cuttings are to be deferred or scheduled in a manner consistent with good forest practices and so as to hold timber for the best market conditions. If ade-

quate credit on appropriate terms is lacking, the cutting of timber can be exploitive and not in the best interests of maintaining our natural resources.

It is in this longer-term field that the Equitable and other life insurance companies are in a position to make a contribution, particularly where large commercial timber tracts are involved. I assume that with their regular farm loans insurance companies also are in a position to provide credit for farmers whose farms include forest land.

Another important part of the timber credit picture is filled in by the federal land banks. Where timber is on farms their lending is widespread. Their financing of separate forest tracts is mainly in the South where loans are available in amounts up to $200,000 to one borrower for terms of 40 years. There is no minimum size of loan but it is usually required that the size of operation be sufficient to be an economic unit. The 40-year term permits considerable long-time development. Under the 1953 amendment to the Federal Reserve Act national banks may now make amortized loans up to 10 years. This will permit banks to be of more help in the developmental aspects of forests than was possible in the past. The Farmers Home Administration has authority to make forest loans under its soil and water conservation program. To date, few such loans have been made.

Thus, taking all of these various lenders together, there is a source of credit available to many segments of the forest industry. There remain two general areas, nevertheless, where there is some question as to the adequacy of credit. First is the financing of reforestation where credit is needed for long periods up to 60 years or more to cover the growth of trees from seedlings to maturity. The deferment of the debt repayment would be too long for most private lenders.

Second, there are many owners of small forest acreages whose operations are often uneconomic and not under the best of management. Ferguson has indicated that loans to many of these would not be profitable to his company. I am sure that this may be the case with many other lenders. Ferguson suggests that commercial banks might provide such credit by teaming up with timber management services who have the forestry "know how." This is an excellent suggestion and I think we may see some progress in the future in this direction. I question, however, that banks can go far enough to meet the credit needs of this entire area.

Ferguson says a special governmental credit agency is not needed for these small forest owners. I agree that private and cooperative credit agencies should be able to supply most of the credit needed by the timber industry. However, the Forest Service states that the "real key to future timber supply is with owners of small forests." These are the

least productive and, if maintaining our forest resources is expected to become a serious problem, some governmental program that combines credit and education may become desirable. Similarly, if it is found necessary to stimulate reforestation by providing loans of 50- to 60-year terms some governmental assistance may be necessary.

Over the years there has been much discussion of some sort of federal forest bank and bills have been introduced in Congress for their establishment. As yet no legislation to this end has been enacted. Conditions change over time and maybe such a governmental agenoy is not now needed. I understand that a comprehensive study is being made of the credit aspects of our forest industry by Resources for the Future, Inc. This study will shed new light on the adequacy of existing credit sources and the possible need for governmental assistance.

During the past decade or two the interest in scientific timber culture by small owners has been spreading. There is a greater appreciation of our timber resources. Sparked by good prices for lumber, pulp, and other wood products and by educational work of public and private agencies and organizations, there is a sharp demand for small acreages of forest land by various investors. Ferguson says the entry of his company into timber credit has been based on the progress made in improved forestry management. All this is an indication that credit can be attracted to the industry. As techniques in timber production and marketing become more refined and as the industry develops and matures I am sure that many private sources will be anxious for this type of credit business.

DISCUSSION: FINANCING FARM ADJUSTMENTS

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I am going to discuss Mr. Garlock's paper "Financing Farm Adjustments" within the context of the theme of these meetings "Agriculture in Economic Growth and Stability" with the bias added that growth and stability are good. My purpose in following this procedure is to point up the existence of a set of beliefs about the facts that are self-contradictory or imply other situations that cannot be true for large numbers of farmers. I present the following as beliefs about the facts that are widely held by many of us.

1. Economic growth and stability in agriculture is impossible without farm adjustments that require financing.
2. The "Farm Problem" though usually stated with reference to its effect or symptom—that of income, is in the final analysis that of

obtaining farm adjustments with reference to size, technology, output and number of farms.

3. National income will be increased if these adjustments that require financing take place.
4. Most farmers could employ additional finance (obtained as debt, equity borrowing, or out of income) and realize a marginal rate of return in excess (a) of their current average rate of return and (b) of the going interest rate (for supporting data see references cited by Garlock in his first footnote).
5. At the present time agricultural debt is relatively low in relation to almost all other relevant magnitudes as compared with past periods (see attached table at end of discussion taken from unpublished materials of The National Bureau of Economic Research).
6. Mr. Garlock states, as have others, that: "In my opinion, most farmers, except those with very low incomes, can obtain all the credit they are willing to use for making farm adjustments."

We now address ourselves to the problem of determining the conclusions that can be drawn in line with the above statements.

Alternative 1, might be that of rationalizing around these supposed statements of fact and assuming the above six statements of supposed fact are correct. The interesting possibilities are:

a. Farmers are ignorant of their possibilities.
b. Farmers lack the ability, skill and initiative required to make these adjustments.
c. Farmers have non-money considerations that make a following of present policies rational and an adoption of more efficient farming operations irrational.

Alternative 2, might be that of rejecting one or more of the above supposed statements of fact. The interesting possibilities are:

a. Farmers can get all the credit and other finance they want but they cannot increase their incomes by financing these farm adjustments while the other five points are correct.
b. Farmers can get all the credit they want but they cannot get the other types of finance (borrowed equity and their own finance) they require while the other five points are correct.
c. Farmers cannot get all the credit they want, while the other five points are correct.
d. Neither farmer income nor national income can be increased by the adoption of farm adjustments but the other points are correct.

We now ask about the implications of accepting some one or combination of these possible explanations of the facts in reverse order:

Explanation 2, d (neither farmer money income nor national money income can be increased by the adoption of farm adjustments, but the other points are correct) is one we would like to be correct for this implies the best of all economic agricultural worlds with no such thing as an agricultural problem in an economic sense, for farmers as a group, but a problem for noneconomists.

Explanation 2, c (farmers cannot get all the credit they want, while the other five points are correct) would not be the most unhappy situation we could hope for. Our problem would then be to simply say Mr. Garlock is wrong and to provide more credit to agriculture. I fear, much to my regret, this simple way is not open to us in explaining the actions of large numbers of farmers.

Explanation 2, b (farmers can get all the credit they want but they cannot get the other types of finance–borrowed equity and their own finance–they require, while the other five points are correct) is next in line and I think contains a significant element of truth. The use of borrowed equity in agriculture is low compared with other sectors of the economy.

Explanation 2, a (farmers can get all the credit and other finance they want but they cannot increase their incomes by financing these farm adjustments, while the other five points are correct) may be a relevant consideration for many farmers. The costs and gains to farmers of adopting more efficient farming operations are not the same as these costs and gains to the entire economy.

Explanation 1, c (farmers have non-money considerations that make a following of present policies rational and an adoption of more efficient farming operations irrational) would be the situation we hope is correct though such a hope is, I fear, wishful thinking. This implies there is no agricultural problem, but only a problem with the people that think an agricultural problem exists.

Explanation 1, b (farmers lack the ability and skill required to make these adjustments) suggests that farmers are earning all that they are able to earn in agriculture and a more efficient agriculture can come only when more competent farmers are grown.

Explanation 1, a (farmers are ignorant of their possibilities) implies that the ability is present in farmers for increasing their efficiency but they are ignorant and need more education.

I will make no attempt to quantify the relative significance of these explanations except to state that I am of the opinion that at least one farmer could be found that would fit into each of the seven boxes. I also think these seven boxes along with their varients can be usefully employed in an analysis of financing farm adjustments as a means of promoting economic growth and stability in agriculture. This classification

TABLE 1.* FARM INCOME, LAND VALUES, AND DEBT, SELECTED YEARS 1914–55

	1914	1920	1929	1933	1939	1948	1954	1955
1. Land in farms, millions acres	909.6	955.9	974.3	1,027.4	1,059.6	1,151.8	1,172.1	1,175.5
2. Improved land in farms, millions acres	488.3	503.1	532.3	532.0	527.5	531.5	533.3	533.6
3. Cash receipts from farming, millions dollars, preceding year	6,328	14,538	10,991	4,748	8,169	29,978	31,457	30,460
4. Cash receipts from farming, per acre of land in farms, dollars	6.9	15.2	11.3	4.6	7.7	26.0	26.8	25.9
5. Cash receipts from farming, per acre of land in farms, Index Nos. 1947–9 base	26.9	59.3	44.1	18.0	30.1	101.5	104.6	101.1
6. Cash receipts from farming, per acre of improved land in farms, dollars	10.6	28.9	20.6	8.9	15.5	56.4	59.0	57.1
7. Cash receipts from farming, per acre of improved land in farms, Index Nos. 1947–49 base	23.1	52.0	37.1	16.0	27.8	101.6	106.3	102.8
8. Land values per acre, March 1, Index Nos. 1947–49 base	62	105	71	43	50	101	122	125
9. Agricultural debt, Jan. 1, millions dollars								
a. Total	6,304	11,903	12,398	9,820	7,745	6,989	11,024	11,764
b. Real estate	4,707	8,449	9,757	8,466	6,779	5,064	7,656	8,176
c. Non-real estate (Commercial banks, PCA's and private lenders discounting with FICB's)	1,597	3,454	2,641	1,354	966	1,925	3,368	3,588
10. Agricultural debt per acre, dollars								
a. Total, improved land in farms	12.9	23.7	23.3	18.5	14.7	13.1	20.7	22.0
b. Real estate, all land in farms	5.2	8.8	10.0	8.2	6.4	4.4	6.5	7
c. Real estate, improved land in farms	9.6	16.8	18.3	15.9	12.9	9.5	14.4	15.3
d. Non-real estate, improved land in farms	3.3	6.9	5.0	2.5	1.8	3.6	6.3	6.7
e. Index numbers of agricultural debt per acre, 1947–49 base								
1. All land in farms, real estate debt	117.9	199.6	226.8	186.0	145.2	99.8	147.4	158.1
2. Improved land in farms, real estate debt	100.4	175.7	191.4	166.3	134.9	99.4	150.6	160.0
11. Foreclosures, no. per 1,000 farms (year ending March 15 of following year)	3.3	4.0	15.7	28.0	12.6	1.2	1.9	NA
12. Bankruptcies, number (years ending June 30)	1,045	997	4,939	5,917	1,422	166	NA	NA
13. Delinquency rate, percent of outstanding loans of federal land banks	NA	NA	5.2	49.3	22.9	4.4	4.9	5.4
14. Ratio, debt to income, percent								
Total debt (Row 9A÷Row 3)	101.1	81.9	112.8	206.8	94.8	23.3	35.0	38.6
Real estate debt (Row 9B÷Row 3)	75.5	58.1	88.8	178.3	83.0	16.9	24.3	26.8
Non-real estate debt (Row 9C÷Row 3)	25.6	23.8	24.0	28.5	11.8	6.4	10.7	11.8
15. Ratio, real estate debt per acre of farm land to land values per acre (Row 10E1÷Row 8)	190	190	320	433	290	99	120	126
16. Ratio, land value per acre to income per acre of all land in farms (Row 8 ÷Row 5)	230	178	161	239	166	100	117	124
17. Debt per acre to income per acre								
a. Real estate, all land in farms to income per acre all land in farms (Row 10E1÷Row 5)	438	337	514	1,033	482	98	141	156

* National Bureau of Economic Research.

system would be useful in a broad policy context in that implications for action programs could be easily drawn if we knew how many farmers fitted into each of our boxes. My personal belief is that we would find the need for programs of many types designed to help farmers as individuals in one or more of each of these boxes.

DISCUSSION: EQUITY FINANCING IN AGRICULTURE

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Mr. Miller has developed a worth-while paper calling attention to the large amount of capital required in agriculture, the technological revolution in farming, the problems of a farmer in meeting these situations, and some of the inefficiencies and related effects resulting from lack of adequate resources. The latter part of his paper outlines a suggestion for applying the corporate legal framework to family farms as a means of providing risk capital and alleviating some of the problems discussed.

In his opening paragraph Miller emphasizes that operators are expected to furnish risk capital and borrow at fixed interest rates and on terms that relieve the lender of most of the risk. Most business-type loans are set up on that basis—and the operator should assume the risk, since he stands to profit from the use of risk capital. It should be recognized, however, that some lenders use various methods in conjunction with the amortization principle to facilitate adjusting payments to ability to pay. Some have a future payment fund where borrowers may accumulate funds, at interest, to meet future installments. Some lenders also have various plans for deferring payment of delinquent accounts when warranted by cimsumstances and the borrower's situation. Under extreme conditions, payments may be reduced to equal the annual crop-share rental income.

The emphasis in the opening paragraph should be broadened to include minimizing risk of loss for the borrower as well as the lender. Good lending will equate size of loan with profitablity of using borrowed funds, and repayment capacity and financial strength of the borrower. Every loan for productive purposes should meet three tests: Will it pay? Does the borrower have adequate repayment capacity? And does the borrower have sufficient financial strength to carry the loan? Answers to these questions are, of course, somewhat interrelated. A loan may not be profitable in the short run, while it may pay well if given more time. In

* The views expressed here are the responsibility of the author and should not be interpreted as representing the views of the Farm Credit Administration.

such a case determination as to whether or not a loan is to be made should depend upon whether or not repayment capacity is available from other sources, and/or upon whether or not financial strength is adequate to permit deferring payments. In some cases a loan may be profitable from the start but repayment capacity and financial strength may be inadequate. Repayment capacity depends upon the income flow, type of loan, and rate of saving. Financial strength is needed since farming is subject to great variations in value of assets and income. Reputable lending institutions are not interested in making loans that involve excessive risk for the borrower. In most cases a good loan for the lender is also a relatively safe productive loan for the borrower.

History indicates that Miller has somewhat oversimplified conditions of the pioneer farmer. He may be describing a more primitive agriculture than developed most of the frontier. But for early agriculture in the major agricultural regions of the country, shortage of capital and credit were persistent and critical. Interest rates were high, terms were for short periods, "outrageous commissions and renewals"[1] were charged, and unscrupulous merchants greatly increased the burden of the farmer. These conditions forced many foreclosures. Feelings were intense and determined. Note the statement of a Populist representative in Kansas in 1890: "We want the accursed foreclosure system wiped out. . . . We will stand by our homes and stay by our firesides by force, if necessary, and we will not pay our debts to the loan shark companies until the Government pays its debts to us. The people are at bay—let the blood hounds of money who have dogged us thus beware."[2]

Miller undoubtedly will agree that obtaining adequate capital to farm always has been a problem. His point really is that the problem has grown in size since much more capital is required today for an efficient family farm. The farmer's persistent campaign over the years for more adequate credit has yielded greatly improved credit facilities. But while credit facilities have been gradually improving the capital obstacle has grown in size. So, today the problem facing the family farm is not so much lack of credit as the large amount of capital required to farm efficiently and the added risk involved in operating a larger unit. He suggests using the corporate legal framework to help solve this problem.

In my opinion, the corporate type of business, as outlined, would work provided someone would buy the common stock. The corporation would have to compete with successful operating farmers, so few, if any, bargains could be counted on in buying land to combine into efficient sized

[1] S. J. Buck, *The Agrarian Crusade: A Chronicle of the Farmer in Politics* (Chronicles of America, Vol. 45), 1931, p. 106.

[2] J. D. Hicks, *The Populist Revolt*, 1931, p. 160.

units. Trained farm managers referred to would have to be paid, of course, which with operating expenses would reduce the return on investment to a figure comparable with what successful farmers obtain. Thus the corporation probably would have to be a quasi-public corporation with the government subscribing for most of the stock—to start with at least.

Would there be any advantage in the corporate organization Miller outlines over the farm-ownership program of FHA? With the corporate organization the farmer with inadequate resources would invest in Class B stock and the corporation would put up the balance needed in Class A stock. After the farmer accumulated sufficient equity, the corporation would redeem the Class B stock at the value of Class A shares. Thus, up to that point the farmer would be carrying only part of the capital and income risk—the proportion being the ratio of his Class B stock to the total stock tied up in the farm. With FHA farm-ownership loans, the farmer buys the entire farm and signs a mortgage so, according to my understanding, he carries all the risk. Thus risk of loss for the farmer would be less with the corporate type of organization. Of course, the farmer would also limit his chances for capital and operating gains in good years.

Similar analysis applies in the case of farm enlargement, transfer of farms from one generation to another, and in using the corporation described to facilitate retirement. Assuming the corporation was not subsidized, it would, of course, have to claim compensation for services rendered, capital invested and risk carried. Whether or not increased income resulting from increased efficiency with optimum size of unit and combination of resources would prove adequate to cover these added claims is a question. The answer would depend, in large measure, on the amount the corporation could increase income. A capable retired farmer, for example, with an adequate unit very possibly could realize a greater return by renting the farm than by turning it over to the corporation. Even if the corporation operated the farm with equal efficiency, the farmer would be entitled to a smaller amount if he contributed less to the operation.

What would be the situation in years or periods when a loss beyond control of a corporation farm operator was sustained? Miller does not cover this question. The corporation could advance funds for operating and living expenses. It is entirely possible that such advances might equal or exceed the value of B stock owned by the operator, particularly where he owned only a small amount. In such cases, a different type of working agreement might be arranged between the corporation and the operator, so the operator would not become hopelessly in debt. For exam-

ple, the operator might work on a contract or hired-man basis, thus letting the corporation stand all the risk. As the operator again accumulated savings, he could repurchase stock in the corporation.

It might be pointed out for emphasis that the value or price of Class B stock would fluctuate with the value of Class A stock. Operators buying or selling Class B stock would, of course, be governed by the current price of the stock in making their decisions. Where an operator was turning a farm with appurtenant chattels to the corporation for Class B stock, or where a farmer had developed sufficient equity to "go it alone" with the aid of a loan, appraisers would have to establish a value or price on the land, livestock, machinery, etc. involved. The values should be as close as possible to current market price. The appraisers probably should be civil service employees, with their salaries and expenses paid by the corporation—in a manner similar to that followed with Federal Land Bank appraisers. The individual farmer would not make his final decision on the transaction until the appraisal was completed.

The amount of capital required for an adequate farm is more than the average man should be expected to provide. The future of the family farm—defined as a farm where the family provides most of the labor—is at stake. Although obstacles undoubtedly would be encountered, I have long felt some system could be worked out to aid in capitalizing farms, to combine small units into adequate farms, and to facilitate transferring going farms from one operator to another. A corporation, such as Miller describes, appears to have possibilities for rendering these services to agriculture. As he points out, with such a corporation a farmer may have only a small equity but with an adequate unit his income producing ability would be considerably increased. Moreover, by not having to save to obtain the large amount of equity required for ownership, the farmer would be able to use more of his income for family living. Even with long-term amortized loans, farmers are forced to save at a more rapid rate than are most other major segments of the population—particularly now that they also have social security.

A corporate organization, such as described, would have the advantage of spreading risks of farming over larger areas. The corporation would share the risk both of capital depreciation and of drops in current farm income. In turn, the farmer being a part owner in the corporation would have part ownership in farms spread over a larger area, and also in different types of farms. If he owned Class A stock, he would also share in current earnings from the larger area. Such sharing would limit the farmer's gains from unusually good years on his own farm, but it would also cushion the effect of poor years.

Such a corporation probably would have appeal for private investors

after it "got going." I would personally like to own a Corn Belt farm but do not have sufficient capital. Buying a share in a farm corporation has appeal for me—although I would want to buy Class B stock so as to have interest in a particular farm. The "parent" farm corporation might thus give birth to small family farm corporations comprised of, say, two to four families.

One more point might also be made. A number of landowners have told me a professional farm management concern increases the landowner's income more than enough to cover the management fee. If that generally is true, an individual might make a larger return by putting his money in such a corporation than by buying a farm and renting it to a tenant.

WHAT IS BEHIND WIDENING MARKETING PRICE SPREADS?

Chairman: H. B. Arthur, Swift and Company
(Joint Meeting with American Marketing Association)

ECONOMIC IMPLICATIONS OF CURRENT TRANSPORTATION POLICY RECOMMENDATIONS

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IN VIEW of the occasion for the presentation of this paper it might be appropriate to add "with special reference to agriculture" to the announced title. It can be said, however, that the interests of agriculture are identical with those of the general public so far as national transportation policy is concerned, although there are certain questions that arise that are of particular concern to agriculture. But agriculture, like the rest of the economy, requires a transportation system that will provide adequate service at the lowest rates consistent therewith. The transport system, furthermore, should be one in which the public can enjoy, as far as possible, the cost and service advantages of each of the principal modes of transport—rail, highway, waterway, pipe-line, and air.

The last year and a half has seen the appearance of a number of important transportation policy recommendations. The first and most widely publicized were contained in the Report of the Presidential Advisory Committee on Transport Policy and Organization, commonly known as the Cabinet Committee Report, or the Weeks Report. Important policy recommendations were also made by the Interstate Commerce Commission in its Annual Report for 1955; and more recently the Select Committee on Small Business of the United States Senate has made certain recommendaitons relating to the regulation of motor carriers. In this paper attention is directed principally to the recommendations of the Cabinet Committee, but not all of these can be discussed. Some attention will also be given to certain recommendations of the Interstate Commerce Commission.

Those who have followed the course of freight rate proceedings before the Interstate Commerce in the last fifteen or twenty years are aware of two developments; first, a succession of general rate increases involving rail, motor, and water carriers, and second, a continuous stream of cases, numbered by the hundreds or even thousands, in which railroads, motor carriers, and sometimes water carriers, have sought to reduce rates on particular movements to meet the competition of other carriers of the

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same or different type. A recent study made by the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission shows that the cumulative percentage increases in freight rates in carloads, since June 30, 1946 have averaged 69.2 percent on products of mines; 74.8 percent on products of agriculture; 94.1 percent on animals and animal products, and on products of forests; 100.1 percent on manufactures and miscellaneous and forwarder traffic, and that on less-carload traffic rate increases have averaged 103.1 percent. These increases have all been in response to increases in transportation costs resulting from higher wages and prices. At the same time, the railroads, and to a lesser extent, the other modes of transport have made reductions in rates on specific commodities for specific movements on an extensive scale. In the year 1954-55 alone, of 6,697 tariff publications filled with the Interstate Commerce Commission that gave rise to protests, 5,939 represented reductions in rates and only 475 reflected increases. To a large extent these reductions represent the increased struggle among carriers for available traffic. To some extent they are a recognition that certain traffic will not bear the full percentage increases authorized by the Commission in the general rate level cases and to some degree they represent efforts to maintain traditional rate differentials. Both the increases in rates and the specific competitive rate reductions have taken place under the watchful eyes and restraining hand of the Interstate Commerce Commission. The Cabinet Committee Report, to which we now come, would facilitate both the process of increasing rates and that of making competitive rate reductions by weakening the restraining hand of the Commission. It would limit the power of the Commission to prevent rate increases, and it would restrict the power of the Commission to interfere with competitive rate cutting.

Competitive Rate Cutting

The proposals of the Cabinet Committee relating to competitive reductions in rates have received the most attention and been the object of the most controversy. These will be considered first. The recommendations of the Cabinet Committee on this question are based on the belief that the Interstate Commerce Commission has not allowed the carriers, particularly the railroads, as much freedom to meet the rates of competing modes of transport as is desirable.

In order to appraise this criticism of the Commission and to understand the specific legislative proposals of the Cabinet Committee, a brief look at the present law and at the present policies of the Commission is necessary. Under existing law carriers are free to file tariffs proposing changes in rates, but they may be suspended by the Commission for a period not exceeding seven months, either upon protest or upon the

Commission's own motion, pending an investigation of their lawfulness. These are known as investigation and suspension cases. As previously suggested most of the requests for suspension of proposed rates in recent years have been against reductions in rates. Motor and water carriers commonly oppose reductions proposed by railroads; railroads commonly oppose reductions published by motor and water carriers; motor carriers frequently protest rate reductions proposed by other motor carriers; and not infrequently railroads oppose reductions proposed by other railroads. All this indicates the vigor and extent of intercarrier competition.

The Commission refuses to suspend the proposed rates in a large number of instances in which suspension is requested. In other instances rates are suspended and an investigation of the proposed rates is made. In the investigation and suspension proceedings the burden of proof is upon the carriers proposing the change, whether upward or downward. The Commission may find the proposed rates justified; it may find them not justified, leaving the old rates in effect; or it may prescribe the maximum *or* minimum, or the maximum *and* minimum, or the exact rate to be charged in lieu of those proposed. A large proportion of the rate cases decided by the Commission in recent years have been suspension cases involving competitive reductions.

Two conditions must ordinarily be met before the Commission will authorize reduced rates to meet the competition of other carriers. The first of these is that the reduced rates are "reasonably compensatory." There can be little criticism of this requirement to the extent that it means that the rates must cover direct or out-of-pocket costs of the particular service and make some contribution to fixed or overhead costs. The second condition that must be met is that the proposed rates are no lower than necessary to meet the competition encountered. This requirement also seems sensible in the interest of preserving carrier revenues. To "meet competition" does not necessarily mean rate parity, but to make whatever reduction seems to be necessary to enable the carrier to share in the competitive traffic. In many cases railroads are permitted to charge less than competing motor carriers because of some disadvantage in the rail service. In cases involving water carriers the railroads are often not allowed to charge as low a rate as the water carrier because the superiority of rail service makes equalization unnecessary.

Although there are provisions in the Interstate Commerce Act designed to prevent the Commission from requiring a carrier to maintain higher rates than would otherwise be reasonable for it, in order to afford protection to other carriers, there are some cases in which the Commission is open to the charge that it has done so. This is the situation to which the railroads strongly object, feeling that they are usually the victims of

the policy; and this is the situation that the Cabinet Committee has sought to prevent by changes in the law.

The Cabinet Committee recommendations that deal most directly with this matter are first, that the Commission be deprived of the power to fix a precise rate, leaving it only the power to prescribe a maximum or a minimum rate as the case may require, and second, that a rate should not be considered less than a reasonable minimum unless it failed to cover the direct or out-of-pocket costs of providing the service. In this connection it should be noted that the Interstate Commerce Commission considers that under present conditions "out-of-pocket" costs are about 78 percent of "fully allocated costs" for the railroads, and that for motor carriers they are from 90 to 95 percent of full costs. It will be seen at once that under the proposed restriction on the Commission's power to prescribe minimum rates, the railroads would be in a position to cut their rates without Commission interference further below a full-cost basis than motor carriers would, hence the bitterness of the motor-carrier opposition to the Cabinet Committee's proposals.

From a strictly economic point of view, something may be said for permitting railroads or any carriers to quote rates for particular services that are less than fully allocated costs, but that cover something more than out-of-pocket costs, if and when it is necessary for them to do so to meet the normal rates of a lower cost agency. This policy has, in fact, long been followed under existing law to a considerable extent. It works to the advantage of the railroads because of the nature of their costs, but if railroads can carry certain traffic at a lower direct or out-of-pocket cost than motor carriers, they may well be permitted to do so. The carrying of the traffic by the railroads under such circumstances results in a smaller total expenditure of resources.

Agricultural interests, or other groups dependent upon railroads, may well support reasonable efforts of the railroads to recover traffic that has been lost to motor trucks. High volume is more essential to low unit costs in the railroad industry than in the motor-carrier industry. Furthermore, if railroads are not allowed to obtain competitive traffic at rates that make some contribution to fixed or overhead costs, the railroads must endeavor to raise rates on such traffic as is tied to the rails. Insofar as the Cabinet Committee Report seeks to give the railroads the right to meet the competition of other modes of transport at rates that make a contribution to fixed and overhead costs, it is sound, if certain qualifications are recognized.

The writer's disagreement with the Report so far as this subject is concerned, however, is two-fold. First, it fails to recognize that generally speaking the Commission has given the carriers a wide latitude in adjust-

ing their rates to meet competition. Space does not permit proof of this point, nor for an analysis of the instances in which the Commission, perhaps for good reasons, perhaps for not as good ones, has departed from it.

The second objection to the Cabinet Committee Report relates to the legislative remedies that it proposes. To deny the Commission the right to interfere with rate cutting only when the rates fall below out-of-pocket costs, seems to open the door to competition of the "ruinous" or 'cut-throat" type. It is one thing to permit a high-cost carrier to meet the normal rates of a low-cost carrier provided the traffic will make some contribution to the fixed or overhead costs of the former; it is quite another thing to permit both carriers to engage in a competitive struggle on an out-of-pocket-costs basis. The framers of the Cabinet Committee proposals seem to have forgotten the lessons of the past. If railroad history proves anything at all, it is that freedom of railroads to cut rates and fight for traffic weakens the industry, jeopardizes its ability to maintain itself on a self-supporting basis, and is the cause of flagrant discrimination between places and types of traffic. There is no reason to suppose that unrestrained competition between railroads and other modes of transport would have any different results. The Cabinet Committee proposal to permit no interference with rate cutting unless rates fall below out-of-pocket costs would create this undesirable situation as well as permit a revival of cut-throat competition among railroads. There are valid objections, also, to other legislative proposals of the Cabinet Committee designed to curb Commission interference with competitive rate making, such as changes in the rate-suspension powers of the Commission. Space does not permit an elaboration of this point.

Curtailing the Commission's Power to Prescribe Maximum Rates

The Cabinet Committee Report not only seeks to curb the Commission's power to restrict rate cutting, but it also seeks to restrict the Commission's power to interfere with rate increases. This would be accomplished by providing that the Commission could not require rates to be reduced below the full cost of performing the services to which they apply. In other words, rates could not be found unreasonably high unless they exceeded fully allocated costs.

Under traditional standards of reasonableness developed under existing law, rates may be found unreasonable, although not covering fully allocated costs, if they are unduly restrictive of the movement of traffic, or if they are out of line with rates on other commodities having similar transportation characteristics, or if they are unjustifiably in excess of rates on other movements of the same commodity. To deprive the Commission

of the power to find a rate unreasonably high unless it exceeds fully allocated costs would deprive the Commission of the right to deal with many important rate relationships, and would prevent it from giving any consideration to the effect of rates on the movement of traffic. In fact, the Commission would find that the rates on many important commodities were entirely beyond its control. A study made by the Commission's Bureau of Accounts and Cost Finding shows that in 1953 a large number of commodities were carried at carload rates which, as a whole, did not cover the fully distributed costs of transporting them. Among these commodities were the following: wheat flour, cereal food preparations, hay and straw, soybean and vegetable oil cake, most fresh fruits and vegetables, frozen fruits and vegetables, livestock, coal, coke, ore, sand and gravel, crushed stone, crude petroleum, phosphate rock, sulphur, logs, pulpwood, lumber, veneer plywood, gasoline, fuel and road oils, brick, sewer pipe, building woodwork and millwork, and animal and poultry feed. Doubtless there are some rates on these commodities that do exceed fully allocated costs, just as there are doubtless certain rates on other commodities that fail to cover fully allocated costs. Many of the commodities mentioned on which rates are generally below fully allocated costs are agricultural products, and some of the others are important articles of consumption on the farm or important raw materials used in the manufacture of goods in which the farmer as a consumer is interested. Certainly this weakening of the Commission's power to find rates unreasonable would subject agricultural interests to the danger of rate increases that the Commission would be powerless to control.

Restriction of Private and Contract Carriage

The Cabinet Committee Report stresses the indispensability of common-carrier transportation, which it correctly speaks of as "the hard core" of our transportation system. It also suggests that the development of private and contract carriage has tended to weaken the common-carrier system. The Report recommends changes in the statutory definition of private carriers by motor vehicle and of contract carriers by water and by motor vehicle the full effect of which would be difficult to predict, but certainly they would be in the direction of restricting and curtailing such operations rather than of extending them. No one can deny the importance of common-carrier transportation or the necessity for a healthy and financially strong common-carrier system, but if restrictions on private and contract carriage are to be justified solely on the ground that these carriers haul traffic that would otherwise be carried by common carriers, then almost any restrictive measures designed to curtail or suppress transportation by private carriers or by contract carriers can

be justified. Both private carriage and contract carriage have a legitimate place in the transportation system, and the public should be wary of legislation that would hamper, restrict, or curtail such operations and force the public to patronize common carriers when private or contract carriage can serve their needs better.

In fairness to the Cabinet Committee it should be pointed out that it acknowledges the legitimacy of private transportation, and by implication at least, recognizes that contract carriage also has a place in the transportation system. It is quite proper also for the Cabinet Committee to concern itself with some very real problems that have arisen because of the existence of private and contract carriers—the problem of definition or delineation of the difference between private carriage and for-hire carriage, and between common and contract carriage; the related question of evasion of regulation by subterfuge; and the need for certain additional regulations on contract carriers—but when the main justification for restrictions on private and contract carriage is the desire to help the common carriers, there is danger of going too far. Private carriage and contract carriage can often provide transportation services that common carriers are not in a position to perform as well or at all. It is highly questionable that the maintenance of a healthy common-carrier transportation system requires restrictions that would hamper or restrict useful contract carriage or interfere with the right of individuals to perform their own transportation services when it is in their advantage to do so.

Mention should be made of the rather surprising recommendation of the Interstate Commerce Commission in its 1955 annual report, that the minimum rates of contract carriers be no lower than the rates of competing common carriers for the same service. Although many states have followed this policy, it is a complete reversal of the policy long followed by the Interstate Commerce Commission. The leading case on this question is *New England Motor Rate Bureau* v. *Lewers & McCauley*, decided in 1941, a case that has long been followed as a precedent. In this case the Commission pointed out that contract carriers can frequently transport at lower costs than common carriers. This is because of the difference in the nature of their operations—the absence of terminals, avoidance of the expense associated with handling a great variety of commodities from many origins and to many destinations over regular routes, and the like. Whether the recent change in the viewpoint of the Commission is due to changes in the composition of the Commission, or to circumstances that have convinced the Commission that past policy needs to be changed, we do not know. A policy of requiring contract carriers to charge the same as common carriers, however, seems inconsistent with the policy of recognizing the inherent advantages of each mode of transport as required by the Act.

The Agricultural Exemptions to the Motor-Carrier Act

Because of the interests of this audience, some mention should be made of the agricultural exemptions in the Motor Carrier Act. When Congress enacted the Motor Carrier Act in 1935 it exempted from regulation motor vehicles used in carrying livestock, fish, and agricultural commodities (not including manufactured products thereof) if such motor vehicles were not used in carrying any other property or passengers for compensation. Horticultural products have subsequently been added to the list of exemptions. The Interstate Commerce Commission has tended to construe these exemptions rather strictly, particularly in drawing the line between the exempt commodities and manufactured products thereof. The courts, on the other hand, have tended to construe the exemptions broadly and have reversed the Commission on a number of occasions. Railroads and the regulated motor carriers favor the repeal of the exemptions. The agricultural interests and shippers of exempt commodities tend to oppose repeal.

The Cabinet Committee refrained from any specific recommendations with respect to the agricultural exemptions other than that the Act should be clarified to indicate what exemptions Congress wishes to give. The Cabinet Committee, however, pointed out that the list of exempt commodities has expanded under court rulings and observed that a continued expansion of these exemptions could destroy the fundamental purpose of the Act.

The Interstate Commerce Commission has made more specific recommendations, proposing that the agricultural exemptions be limited to transportation from farm to market or to the point of first off-the-farm processing or to storage. Although the suggested exemption may not be free from difficulties of interpretation in its application, it at least has the merit of exempting the movements of agricultural products for which exemption can be logically justified, and not exempting movements of agricultural products for which justification is either nonexistent or not clear. Justification of the farm-to-market exemption is based on the perishable nature of the product coupled with the varying and seasonal demands for service of this type—a type of service that does not lend itself to the kind of control exerted over intercity transportation of general commodities. If there is any justification for exempting the transportation of agricultural products from regulation beyond the farm-to-market movement, it should be clearly established.

Rate advantages of a temporary nature may possibly accrue to shippers of exempt commodities when the movement is beyond the first market or processing point. If these rate advantages result from competitive excesses, or from the use of inferior or substandard equipment, or from violations of safety regulations, or from inadequate insurance, or

from failure to assume the responsibilities of common carriers, the advantages are temporary, or result from unlawful or otherwise objectionable practices. If there are any permanent and legitimate rate advantages in unregulated transportation, then we are justified in raising two further questions: first, why are not commodities other than agricultural commodities entitled to exemption; and second, is motor-carrier regulation failing to achieve one of its objectives, namely, the establishment of an adequate and efficient transportation service at the lowest cost consistent therewith. Thus we conclude our discussion of the agricultural exemptions by raising even more fundamental questions.

Conclusion

This paper has been confined to what the author considers to be some of the more important proposals in recent policy recommendations. The proposals discussed, as well as some that we have not discussed, should not be hastily adopted. They require careful consideration lest hurried action lead to unwise legislation and even more serious problems at a later date.

SALIENT FEATURES OF RISING MARKETING COSTS

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FOR my assignment in this afternoon's discussion of "What's Behind Widening Marketing Price Spreads?" the following quotation provides a good starting point:

"The first question that arises is why is it that retail prices have not declined in the same proportion as farm prices, and why is it that the spread between what the producer receives and what the consumer pays has increased so much in the past few years? Evidently the reasons are many and varied, but some of the most important are high freight rates, high wages, and rents and possibly larger profits to the distributors. One of the great problems facing this country today is how can we lower the cost of food to the consumer and increase the price received by the producer, which is now entirely too low."

To one residing in the uncloistered halls of the South Building, USDA, this statement has a most familiar ring—even though it was made in the year 1922.[1] Retail prices of food products *have* declined in the last few years but not in the same proportion as farm prices. The spread between what the producer receives and what the consumer pays *has* increased. The reasons for this increase in the farm-retail price spread *are* many and varied and some of the most important are high freight rates, high wages, and *possibly* larger profits to the distributors and processors of agricultural food products. And not much exposure to the current political campaign is needed to know that one of the "great problems facing this country today" is how we can increase the price received by the producer.

The salient features of rising marketing costs in the last few years and public concern over them are neither new nor too much different from those of some previous decades. It did not take an exhaustive review of the "literature" to reveal this. "Built-in maid services" provided with food nowadays are not a new feature but they have received increased emphasis in recent years as an explanation for higher costs. More about that later.

We can best examine our subject of rising marketing costs by discussing both trends in unit marketing costs and aggregate marketing costs. Throughout this paper I shall use the term "marketing" in a broad concept, including all activities in getting products from the farm to the consumer in the form, time, and place desired.[2] The salient features

[1] J. H. Meek, Director of the Division of Markets, Virginia Department of Agriculture, quoted in the *Richmond Times-Dispatch* of Feb. 12, 1922.

[2] The rationale of the use of th's definition is discussed in "What Is the Marketing Margin for Agricultural Products? A Rejoinder" by Harry C. Trelogan and Kenneth E. Ogren, *The Journal of Marketing*, Apr. 1956, pp. 403-406, and in other references cited in this article.

related to longer term trends in rising marketing costs will be considered rather than short-run fluctuations in market price spreads that often do not coincide with actual changes in marketing costs. This paper also is concerned primarily with food products, although many of the conclusions apply equally to marketing nonfood agricultural products.

Trends in Unit Marketing Costs

The Department's "Market-Basket" statistics are the best available measure of changes in per-unit marketing costs. These statistics, which are essentially index-number measurements, compare to retail-store cost of a family market basket of farm food products with the farm value of equivalent quantities of products. The marketing margin—the difference between the retail cost and farm value—therefore measures the charges made by marketing agencies for the services associated with a fixed market basket of farm food products bought by consumers in retail food stores.

According to these statistics, the marketing margin (which includes both costs and profits of marketing agencies) has increased markedly over the last decade, with an increase in each year except one. It is now 20 percent higher than in 1950 and more than 70 percent higher than at the end of World War II.

Most of this widening in price spreads during the last decade, however, came during two periods of general price inflation following World War II and during the early part of the Korean conflict. Since 1952, the marketing margin has not risen appreciably—an average of 1 to 2 percent per year. The farmer's share declined from 47 percent in early 1952 to 38 percent by the end of 1955 (as measured by the market-basket series) mainly because of lower farm prices rather than higher marketing margins.[3] This is not a new phenomenon. Marketing margins are characteristically less flexible than farm or retail prices.

Labor Costs and Productivity

In looking for an explanation of what has caused the increase in price spreads over the last 5 to 10 years, one quite naturally looks first at the cost of labor, the largest cost item. Trends in unit marketing charges necessarily are influenced to a considerable extent by trends in per-unit labor costs. The labor bill of most processing and distributing agencies accounts for one-half or more of their gross margins (difference between raw-material costs and selling price). And prices of many materials and services bought by these firms—packaging materials, containers, fuel,

[3] The farmer's share rose from 38 percent at the end of 1955 to 41 percent by the middle of 1956 because of increases in both farm and retail prices, illustrating the responsiveness of the farmer's share to changes in price levels.

and even advertising—are to a large degree labor costs. Labor income is almost 70 percent of our total national income; with the large element of labor services present in distribution, this proportion is likely to be as large or larger in marketing food products.

We can be fairly certain even before examining available statistics that trends in labor cost per unit of product marketed are highly correlated with both trends in hourly earnings and in unit marketing charges. Although the indicator most often used to describe changes in labor costs is hourly earnings, it is obviously inadequate and sometimes misleading. Hourly earnings do not equal the trend in average labor cost per unit if output per hour worked—that is, productivity—has changed.

Furthermore, hourly earnings are not the total cost of labor; fringe benefits are becoming increasingly important. Changes in relative amounts of straight time versus overtime also affect trends in the actual labor bill. But a specific measurement of unit labor costs is a herculean task because of the difficulty of measuring output of marketing services and, to a lesser degree, that of estimating a total labor bill. Nevertheless, some tentative conclusions can be made from available data that I believe are both significant and seem consistent with reasonably acceptable or rational hypotheses.

If we start out with our admittedly imperfect measure of labor costs—hourly earnings—we find that wages of employees in food processing and distribution now average about a third higher than in 1950 and are more than double the average at the end of World War II. Although average hourly earnings have increased in each year over the last decade, the greatest increases in cents per hour as well as percentagewise came during the two inflationary periods of 1946-48 and 1950-51. The smallest percentage increases have occurred since 1953.

Estimates of labor costs per unit of product marketed indicate an increase of less than one-fifth since 1950 and 80 percent since 1945. These increases are considerably less than the wage increases, but they do correspond quite closely to trends in unit marketing charges. It should be noted that these measurements of unit labor cost are likely to have some upward bias because additional services may not be reflected fully in the denominator of our formula. (Unit labor cost is the quotient of the indexes of total cost of labor and of the volume of food products marketed to domestic civilian consumers.)[4]

From 1945 to 1951, it appears that unit labor cost increased slightly

[4] These statistics are given on p. 7 of *Trends in the Cost of Labor in Marketing Farm Food Products*, AMS-117, USDA, May 1956. For further description of some of the labor statistics used in this paper see this report and "Labor in the Marketing of Farm Food Products," *Agricultural Economics Research*, AMS, USDA, Apr. 1955, pp. 42-49.

faster than unit marketing charges, but since 1951 unit labor cost has tended to increase at the same rate or slower. Also, during the earlier period unit labor cost increased almost as rapidly as hourly earnings of food marketing employees. Since 1951, however, hourly earnings have increased more than 20 percent while the increase in unit labor cost has been less than 10 percent, with most of that increase between 1951 and 1953.

Although these data are too inexact to be considered conclusive, the inference that output per unit of labor has increased markedly, particularly in the last few years, appears to be consistent with other available data. The steady increase in wage rates has stimulated investments in labor-saving machinery. The cumulative effect of multi-billion-dollar investments in new plant and equipment by marketing firms since World War II is likely being reflected in an expanding rate of productivity during recent years. Since World War II, during which there was little investment in food marketing facilities, about 9 billion dollars in capital outlays have been made by food and beverage processors (according to surveys made by the U. S. Department of Commerce and the Securities and Exchange Commission). Comparable data are not available for the distributive food trades but it is probable that their total investments are not too far behind those of the processors.

The effect of these large investments on the cost structure of corporate business is indicated by the rapid growth of "capital consumption allowances" and the increasing proportion of corporate gross product that they represent.[5] Between 1946 and 1954, capital consumption allowances (mainly depreciation charges reported in corporate tax returns) almost tripled while employees' compensation increased by only about 90 percent, although, of course, these labor payments still account for the major share of corporate gross product. (It should be noted that these data are for all corporations, not just food marketing firms.)

Census data now available tend to confirm a substantial increase in productivity. The number of employees in food processing reached a peak in 1950 with evidence of a slight decline thereafter despite a continued increase in total food processed. Total man-hours of production workers have declined more than the number of employees. In retail food stores average sales volume increased more than 50 percent between 1948 and 1954, after adjustment for the higher price level. This striking increase in average store volume has undoubtedly brought with it a substantial increase in average volume per retail-store worker.

Two observations on the subject of labor costs as a causal factor in higher marketing costs are appropriate here. First, trends in hourly earn-

[5] "Corporate Profits Since World War II," *Survey of Current Business*, U. S. Dept. Commerce, Jan. 1956, pp. 8-20.

ings of food marketing employees closely parallel the general trend in other industries. For the most part, food industries follow the pattern laid down by "pace-setting" groups; this is especially true of the retail trade, which employs the largest percentage of food marketing workers.

The other observation concerns the effect on farm prices of higher labor costs in marketing versus the effect of higher labor income on increasing the demand for farm products. It is likely that a sizable part of the increase in farm-retail price spreads over the last 5 to 10 years is attributable to higher labor costs. However, the overall rise in wage rates of all labor during this period has been reflected in a much larger increase in the total purchasing power of labor. To what extent these forces are countervailing ones is almost impossible to determine.

Other Cost Factors and Profits

Transportation has been discussed this afternoon. The rather substantial increase in rates over the last decade also has been a definite factor in the increasing marketing margin, especially for perishable products shipped long distances. Higher transportation charges are not unrelated to the general rise in labor costs, as the labor bill is a large part of the total costs of transportation agencies. As is true for labor, transportation rates are not necessarily the real measure of actual changes in transportation costs.

We might speculate on several other cost factors that are probably contributing to higher unit marketing charges, although as a proportion of total costs they are not likely to be too significant. Among these are State and local property taxes and other fees and licenses of all kinds. Others may include advertising expenditures and promotional gimmicks such as coupons and trading stamps.

Profits are another item that must be considered in our discussion, because the spotlight is so often focused on them. Generally, less than 5 percent of total marketing margins is taken up by corporate profits after deduction for income taxes. Because they are a residual item, they are the most variable item in the whole picture. The fact that profits this year for a firm or group of firms are double last year's rate may not be too significant if last year's rate was 50 percent below the average for the preceding 5 years. Moreover, any conclusions about trends in profits per dollar of sales are not value judgments *per se* about the profitability of these firms. Even though its profit per dollar of sales may be less than 1 percent, a firm with a large volume of business and a rapid turnover may yield a handsome dividend rate and capital gains to stockholders in addition to generous salaries and bonuses to executives. However, returns on stockholders' equity in food trades generally are relatively modest in comparison with other industries. The essential feature of

profits as they relate to our topic this afternoon is that profits apparently have not been a major factor in the widening price spread over the last 10 years.[6]

Marketing Services Versus Marketing Costs

Now for what seems to many observers a popular explanation for rising marketing costs—the built-in maid services that housewives are buying with their food nowadays. As a factor in increasing the unit marketing charges which we have been discussing thus far, these added services necessarily are of minor importance. The market-basket series is designed to measure trends in the charges for a fixed quantity of marketing services and does not reflect to any marked degree changes in marketing services or types and quantities of foods bought by consumers.[7] True enough, there has been a gradual upgrading of many foods included in this market basket, and any increases in costs associated with such additional services as washing and prepackaging fresh fruits and vegetables, slicing and vitamin enrichment of bread, or even the cowboy cutouts for the kiddies on the cornflakes packages would be reflected in the marketing margin of the market basket. Not measured are the effects of consumers buying more processed, ready-prepared, and convenience foods such as TV dinners and chicken potpies.

These added marketing services obviously cannot be ignored in any analysis of trends in aggregate marketing costs. In addition to the many built-in maid services bought with foods in supermarkets, consumers now have more of their meals served to them in restaurants than before World War II. Also, a larger proportion of our food goes through the marketing system; fewer people live on farms where a large part of the food supply is obtained from their own production.

The total costs for marketing farm food products in 1955 are estimated at over 32 billion dollars, up from 18 billion dollars in 1946 and 9 billion dollars in 1940.[8] After allowance is made for the rise in unit marketing costs and the increased volume of food handled, a surprisingly small part of the total increase is left as a residual. Of the 23-billion-dollar increase

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[6] For a further discussion of profits in food marketing see "Trends in Corporate Profits in Marketing Farm Food Products," *The Marketing and Transportation Situation*, July 1956, pp. 9-23.

[7] New products are added to the market basket and weights for individual products are changed periodically to keep the market basket representative of current food purchase patterns. Whenever these weights or the specifications of the products priced are changed, prices for adjacent time periods are "linked" together as in the procedure used in the Bureau of Labor Statistics Consumer Price Index. Further details concerning the calculation of these statistics are given in "Price Spreads for Farm Food Products, Revised Series, 1946 to Date" in the Supplement for July-Sept. 1953 of *The Marketing and Transportation Situation*.

[8] "The Farmer's Share: Three Measurements," *Agricultural Economics Research*, Apr. 1956, table 3.

between 1940 and 1955, all but 6 billion is accounted for by higher unit costs and larger volume.[9] Comparisons based on periods since 1946 indicate an even smaller proportion of the total rise unexplained by cost and volume.

Several factors seemingly account for this. Many of the processed and prepared foods on today's grocery shelves cost little if any more than the same food in a less highly processed form. Apparently the savings in costly transportation and storage of highly perishable products and, in some instances, substantial economies resulting from new technology, have offset any cost of added processing for many products. Furthermore, the modern housewife is still price conscious to the extent that the convenience foods that give her the best bargain are the ones that have set the best sales record. Many of the frozen fruits, vegetables, and juices, as well as cake mixes and cut-up, ready-to-cook chicken, are examples of these "low-cost" processed foods with high sales volume.

Closely related to the preceding argument is the proposition that the exotic convenience foods are only a small part of the average housewife's food budget. These processed foods in the more costly forms have not made great inroads on the so-called staples like milk, bread, meat, eggs, and others which make up a major part of most household food budgets. Moreover, many processed products such as canned fruits and vegetables, bread, crackers, and other bakery products are not new shopping items to most housewives.

An increase in proportion of meals eaten out pushes the total marketing bill up faster than any other shift in marketing services or channels, because one-half or more of the food cost is for personal services of meal preparation and serving. During World War II, meals eaten out increased sharply but in 1955 purchased meals and beverages accounted for about the same proportion of food expenditures as in 1946, so that meals eaten out have been less of a factor in higher marketing costs in recent years.

Another factor tending to offset added costs of more marketing services is the increasing importance of meats and animal products in the consumer's diet relative to cereal products and potatoes. What this means is that while more marketing services are being provided with most individual food products, consumers have shifted their purchases to product groups for which marketing resource use is relatively low and farm resource use is high. For example, the volume of poultry and eggs (weighted by 1947-49 average prices received by farmers) marketed for domestic civilian consumption in 1955 was 40 percent higher than in 1946 while the volume of grains used for food products did not increase any over the last decade (reflecting an actual per capita decline).[10] The

[9] *Marketing Costs for Food,* USDA Misc. Pub. 708, Dec. 1955, p. 11.

[10] These statistics are based on an unpublished Agr. Market. Serv. index. Farm food marketings equivalent to domestic civilian consumption of foods (after deduc-

red meats as well as the poultry and eggs group have increased at the expense of the grains and fruits and vegetables groups. On the average, the farmer's share of the consumer's dollar going for the two meat-product groups is about twice that of the other two groups. (The farmer's share is a rough measure of the relative balance between farm and marketing resources used in various products.) Or, measured in another manner, the average per pound value of farm food marketings at 1947-49 prices has increased about 10 percent between 1946 and 1955 because of the shifts to higher farm resource products.[11]

Over-all Conclusions

What does this all add up to? Marketing costs on a unit basis have increased only moderately in recent years, following large increases in two earlier inflationary periods. It is only when the trend in marketing costs is contrasted with recent trends in farm prices that the record may appear bad. The largest component of marketing costs—unit labor costs—likewise has shown only moderate increases in the last few years. Consumers are receiving more and more services with their food purchases, but for various reasons the cost of these added services does not appear to be a major factor in rising marketing costs. Not the least of these reasons is the increasing efficiency and productivity of the marketing system, which has made possible more services for given inputs.

Marketing costs are likely to continue their steady rise of recent years. Consumers seem able and willing to pay for still more services with their food and economic forecasters do not foresee any prolonged deflation that would reverse the upward trend in costs and prices.

If there is any moral to be drawn, it may be that we should emphasize the tremendous progress that has been made and is being made in the job of processing and distributing food products. The age of specialization has increased the tasks performed by the marketing system in getting food on the consumer's table relative to those done by farmers and housewives. Therefore, the general proposition that marketing and marketing costs take a larger and larger share of the food dollar is not inconsistent with progress in a changing and expanding economy.

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tion of volume of foods consumed where produced and nonfood by-product uses) were weighted by 1947-49 average prices received by farmers. This index gives the best measure of the changes in volume of inputs of farm food products into the marketing system. The trend of this index is roughly similar to the food component of the AMS index of volume of farm marketing or the AMS index of per capita food consumption multiplied by an index of civilian population. The former index does not take account of changes in stocks, exports, and nonfood uses while the latter index includes imported foods as well as home-produced foods.

[11] To obtain this measurement, weighted aggregates computed for the index described in footnote 10 were divided by the total pounds of farm food products equivalent to civilian consumption from marketings of domestically produced foods.

ALTERNATE APPROACHES TO THE MARKETING MARGIN–FARMER'S SHARE CONCEPT

FRANK M. ATCHLEY*
Grocery Manufacturers of America

IT IS both a pleasure and a privilege to appear before you agricultural economists this afternoon. I have attended most of the Association's meetings during the past 20 years and have always found them interesting and challenging. I hope my part in this marketing session will help maintain the standard.

My subject is "Alternate Approaches to the Marketing Margin–Farmer's Share Concept." In effect, your program committee has asked me to do two things. First, to state what we at Grocery Manufacturers of America think is wrong with the traditional government measure of the farmer's share of the food dollar–to state whether or not we think it has any meaning at all. Second, to suggest what we think can be done to develop a new, improved, and realistic measure to replace the old one.

Agriculture and Food Manufacturing Interdependent

At the very beginning I want to make two background points quite clear. One is the attitude with which we at GMA approach all farm matters, including my subject today. Our member manufacturing companies–in fact food processors as a group–recognize the teamwork interdependence that exists between farming, food processing and distribution. One evidence of this is GMA's over-all guiding theme. That theme is: "The Life Line of America–the line of essential processes between food in the field and food on the table."

Food manufacturers have an immediate and many-sided interest in the welfare of agriculture. They are the largest purchasers of farm food products, and farmers are large purchasers of processed food products. Processors fully recognize that if we are to have a continuing prosperous total economy, we need a prosperous farm economy. Moreover, it takes a healthy agriculture to supply the necessary quality and types of raw products for conversion into the kinds of processed foods needed to satisfy consumers discriminating tastes.

Food Growth Fabulous

My second background point is this. The concepts of "farmer's share" and "spread" cannot be discussed in a vacuum as abstract statistics. They can be discussed realistically only against the background of the dynamic, changing American economy of which the food industry is an important

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part. Let us consider this dynamism as it applies to food. The food industry in the past 16 years has had a fabulous growth. Total consumer expenditures for food have risen from about $16 billion in 1939 to $68 billion in 1955. Indications are that this may reach $71 billion in 1956 and $100 billion by 1965.

This amazing growth record could not have been forecasted on the basis of the increase in population and income alone. In the middle of the last century Engel maintained that the percentage of disposable income spent for food declined when income rose. That doesn't hold today. The American people, with the highest income in their history, are now spending about 25 per cent of their personal disposable income for food as compared to 23 per cent in 1935-39. For this they are receiving a basket of groceries that is nearly 50 percent improved in terms of such things as quantity, quality, packaging and convenience. If the homemaker were now buying the same items that she bought in 1935-39 they would cost her only 16 percent of her disposable income compared with the 25 percent she is actually spending. In short, Americans are buying more baskets of food, different baskets of food and better baskets of food than they did 16 years ago.

Paralleling the changes in the types of food we buy, there have been tremendous changes in manufacturing, wholesaling, and retailing methods. As you well know, there have been almost revolutionary changes in farming methods. In view of these many changes, it is virtually self-evident that a statistical measure that breaks a "constant" consumer's food dollar into two percentage parts—"farmer's share" and "spread"—should have become outmoded, unrealistic, and misleading. We definitely believe that these words correctly describe the government's traditional market-basket measure of farmers share and spread. Later in my remarks I will explain why.

What Is Spread?

Let me now spend a moment on definitions of price spread. Limiting the definition to arithmetic, price spread is usually defined as the difference between prices farmers receive for raw agricultural products and the prices paid for the corresponding food by consumers at the retail grocery store. But the definition needs to go beyond arithmetic to have any real meaning. We need an operating definition that shows what spread does.

Spread is a payment for a series of values added by processing, packaging, transporting and distributing. Without spread, not only manufacturers and distributors, but farmers as well would be out of business. Our bread would be wheat on a Kansas farm, our cheese and butter would be milk in a pail in Wisconsin, and our breakfast juice would be on

the trees in a Florida or California orange grove. Without spread there would be no food business as we know it. The food business would consist of local farmers selling direct to local consumers. However, spread *has* come into being. It has arisen because there were valuable services to be performed between farmers and consumers. As a result, milk does not stay milk on a Wisconsin farm but it is converted into cheese, packaged, transported and sold all over the world.

Historically, the pioneer who slaughtered his own hogs and raised his own wheat and ground his flour did not concern himself about spread. There wasn't any. Spread was not an important consideration as long as Americans consumed only the produce of local farms. But as America grew and people moved to the newly developed cities, the need for processing, packaging, transportation and distribution was created.

Today spread is money paid out for a series of essential processes and services performed along the "Life Line of America"—between food in the field and food on the table. It provides useful employment directly to at least 5 million workers and indirectly to several million more. It helps build markets for farm products. It is an integral part of our mass-production, mass-distribution system. It is a logical reflection of the growth of the American economy with its great degree of specialization, its greater services to meet consumer needs, and its high standard of living. One of our main challenges is to get the American people to see spread in its true economic role—as a *positive, value-adding, market-creating force*—and to see how *they benefit* therefrom.

Let Us Bury the Middleman Term

Just as spread came into being with the growth of the economy, so did the term "middleman." Back in that early day when the pioneer ground his own flour, there was no middleman. Later, though, there did develop handlers of products between farmers and consumers who were called middlemen and perhaps at least some of them deserved it. This was a period of ownership-management when the selfish quest for quick profit was unfettered by any widefelt need to consider the supplier, the buyer, the employee or the public. Today it is different. Today our modern foods are provided to the public by a *team*. We have professional management in food businesses—fully conscious of the needs to serve well not only their stockholders, but the farmers who supply the raw product, their employees, and their consumer and distributor customers.

They have a teamwork concept and a long-run point of view. Our food travels a continuous, moving, never-stopping road from the farm to the consumer. The term middleman is as out of date as a span of mules on a modern cornbelt farm. Let us quit using the term. Let us bury the term middleman once and for all.

How the Traditional Measure of Farm Share and Spread Was Developed

Just how and when the first statistics in this country on the farmer's share of the food dollar were developed, we have been unable to discover. We know some spread studies were made when farm prices went down following World War I. Warren and Pearson of Cornell University published a general list of food-price margins in January 1928. Work of a similar nature was being done by others, including economists in the Department of Agriculture, who were developing data on a market-basket base. However, the first official publication of these market-basket figures was not brought about until 1935. At that time the Agricultural Adjustment Administration requested a set of such figures to be used in studying the effects of the adjustment programs on prices and price spreads, and to examine results of the processing taxes then in effect. Thus was born an official statistical measure which has been confusing the public understanding of the food industry ever since.

What Is This Market-Basket Measure?

Statistics on the farm value of the produce going into the family retail market basket of food, the total retail cost of that basket and the spread (or marketing margin) have been published by the U. S. Department of Agriculture since 1935. The percentage proportion that this farm value is of the retail cost of the basket of food has become known as the farmer's share of the consumer's food dollar. The entire remainder of the retail cost of the basket has been referred to as spread (or marketing margin).

My description of this market-basket series is based on a recent article by Kenneth E. Ogren of the Department of Agriculture, who has been participating in the search for an alternative measure. The farmer's share calculated from the market-basket statistics compares urban retail-store costs of farm-food products with payments received by farmers for equivalent quantities of raw produce on both a dollar and a percentage basis. It is published monthly by the U. S. Department of Agriculture. See Table 1. It applies only to retail store purchases and does not include expenditures for food bought through other distributive channels. The retail-store cost[1] is computed for a typical family market basket of foods which includes the estimated quantities of farm-food products bought for consumption at home per urban wage-earner and clericalworker family in 1952. For each of the retail quantities, corresponding farm-produce equivalents are estimated and the farm value computed by multiplying the farm-produce equivalents by average prices

[1] Calculated from retail prices collected by the Bureau of Labor Statistics, U.S. Department of Labor.

received by farmers.[2] This market-basket statistic measures changes in the cost of a fixed quantity of agricultural products and marketing services.

Our Criticisms of the Market Basket

You already know that we think the market-basket figure is outmoded, unrealistic and misleading as a measure of how well the farmer is

TABLE 1. THE AVERAGE FARM FOOD MARKET BASKET, 1946–55

Year	Retail cost[1]	Farm value[2]	Marketing margin	Farmer's share
	Dollars	Dollars	Dollars	Percent
1946	$ 767	$397	$370	52
1947	932	471	461	51
1948	994	498	496	50
1949	939	435	504	46
1950	924	432	492	47
1951	1,026	495	531	48
1952	1,035	482	553	47
1953	1,010	450	560	45
1954	993	425	568	43
1955[3]	975	396	579	41

[1] Retail cost of average quantities of farm foods purchased per urban wage-earner and clerical-worker family in 1952, calculated from retail prices collected by the Bureau of Labor Statistics.

[2] Payment to farmers for equivalent quantities of farm produce minus imputed value of by-products obtained in processing.

[3] Preliminary estimates.

Source. *The Marketing and Transportation Situation*, August 12, 1954 and July 24, 1956. Agricultural Marketing Service, U.S. Dept. of Agriculture.

doing as a partner in the modern food industry. From a technical standpoint here are some of our criticisms: (1) The series applies only to the farm-to-retail-store marketing channel. (2) The figures are reported and publicized primarily as percentages and people don't live on percentages as such. (3) Neither these percentages nor the dollar figures take account of changes in volume of food marketed; and, except over long periods take no account of changes in the types and relative amounts of various foods actually being consumed. (4) The whole gross-percentage-margin concept of these figures tells nothing directly about net profits or efficiency of either farmers, processors or distributors.

Present Measure Causes Confusion

The established method of reporting farmer's share and spread as a percentage of the consumer's food dollar has contributed to a wide misunderstanding of the true economic relation of agriculture to food processing and distribution. It has made them appear as competitors

[2] Computed by Agricultural Marketing Service, U. S. Department of Agriculture.

for a fixed value, rather than as partners in the production of greater values.

For some reason or other, many people, particularly some farmers, believe that there is some magically correct percentage division of the consumer's food dollar that will assure economic equity to all concerned. Attitude surveys for example indicate a belief that 50 per cent is a magic figure; that the farmer should rightfully get no less than half the food dollar.

A major source of confusion is the use of this over-all percentage market-basket figure. Neither farmers, nor anyone else, lives on percentages. Yet there is an understanding tendency for people to think that the higher the percentage share the farmer gets from the food basket, the higher will be his share in dollars. The two sometimes go together, but not always. Meanwhile, these government percentages are used in the public press, in radio and TV broadcasts and in Congress to indicate the welfare of farmers, and in some cases to pit one part of our economy against another.

Here is an example of the ambiguity of the percentage-share figures. The farmer's share dropped from 52 per cent in 1946 to an average of 41 per cent in 1955. See Table 1. The immediate interpretation might well be that farmers got about 20 per cent less money in 1955 for the raw ingredients going into the family market basket than in 1946. Actually, farmers received $396 in 1955 for the raw food ingredients going into this hypothetical (and fixed) market basket, only one dollar less than in 1946. Furthermore, there were more baskets of all types sold to more consumers, and the actual purchases contained different products, in different quantities—than in 1946. Taking all these changes into consideration, farmers actually received nearly three billion more dollars (about a 20 per cent increase) for the raw foodstuffs they sold for domestic consumption in 1955 than they did in 1946. Table 2 shows the pertinent figures.

Experts Agree Measure Obsolete

Some time ago, when the farmer's share of the consumer's food dollar was going down, we asked a number of people, whom we considered experts in the field, their opinion of the term "farmer's share of the consumer's food dollar." We received such opinions as "It's often misunderstood," "It's obsolete," and one expert said it is "A meaningless expression." Another one said, "It tells us nothing about the level of farm income, marketing efficiency or profits of marketing agencies." Who were these "experts"? They were leading agricultural economists—some of whom are sitting right here today.

One agricultural economist said that "I think we can say that the

farmer's best interests are not always served by increasing the farmer's share of the consumer's dollar. If they were, then farmers would sell directly to consumers. But the marketing system which we have developed does the job cheaper than farmers can do it. If an added marketing service increases the market or the value of the final product more than the costs, farmers stand to benefit from the added service even though it may lower the farmer's share."

TABLE 2. THREE EXAMPLES OF WHAT THE FARMER RECEIVED FOR HIS FOOD PRODUCTS, 1940 AND 1945–55

Year	Farmer's percentage share of the retail value of the fixed "market basket"	Farm value of the raw food ingredients in the fixed or average "market basket"	Money received by farmers from sale of raw foodstuffs for domestic food consumption
	(Percent)	(Dollars)	(Billions of Dollars)
1940	40	—[1]	$ 5.6
1945	53	—[1]	12.6
1946	52	$397	15.7
1947	51	471	18.7
1948	50	498	19.2
1949	46	435	17.1
1950	47	432	17.7
1951	48	495	20.3
1952	47	482	20.2
1953	45	450	19.3
1954	43	425	18.8
1955	41	396	18.3

[1] Not available on comparable basis.

Source. Various issues of the *Marketing and Transportation Situation*, Agricultural Marketing Service, U.S. Dept. of Agriculture.

Certainly anyone interested in marketing efficiency should consider not only the share of the consumer's dollar that goes to each handler of the product, but also the services that are desired. Some of the newer developments have to be considered in determining what agriculture's share ought to be. This same opinion was voiced at the time of the survey by one of this Farm Economic Association's recent past presidents.

Farmers are interested in income rather than proportions, and the farmer's share of the consumer's dollar is not necessarily a measure of the farmer's well-being, according to others who replied to the letter.

A professor of marketing said it this way. "Certainly it would be impossible to make any judgment of the adequacy of income to all farmers or a group of farmers on the basis of the level of the share of the consumer's food dollar they receive. For example, tobacco producers receive a very low per cent of the 24 cents you and I spend for a pack of cigarettes, yet as a group may be as well off financially as egg producers who receive a much higher proportion of the money we spend for eggs. . . . Farm

income might better be studied by an analysis of costs and returns on individual farms."

Developing a New Measure

For the many reasons I have indicated, a new concept and some modern statistics are badly needed to replace the market-basket figures. That brings me to the second part of my assignment—namely to explore what we can do to develop a new, improved and realistic measure. I have no pat answer to present, but I do have a few constructive suggestions. In making these, it is encouraging to know that others are also giving thought to this problem. For example, Kenneth Ogren of the Agricultural Marketing Service recently published a very instructive article[3] in which he explored some of the possible answers, and I know many of you are engaged in the search.

The Marketing-Bill Series

The first thing to which I would call your attention, as we search for a new measure, is a set of statistics which is already available. This is the so-called "marketing-bill series" published by the Department of Agriculture. It is published less frequently than the market basket and is not given anything like as much attention in the public press. It would be a safe guess that most of those who speak most glibly, and argue most vociferously, about the farmer's share do not even know that the marketing-bill figures exist.

Yet these latter figures—while incomplete—give a much truer picture of the food economy, and the farmer's position in it, than does the outworn market basket. Furthermore the Department is improving the marketing-bill series[4] to take account of the changing types and quantities of food consumed, and the shifting channels through which it is purchased. We compliment the Department for these improvements, and Harry Trelogan and Mr. Ogren for their part in that operation.

The marketing-bill series shows three major figures (see Table 3):

(1) The total consumer expenditures for all domestic farm food products. This is called "market value" in the series.

(2) The total cash receipts of farmers from the sale of the raw food entering into the above consumer expenditure.[5] This is called "payments to farmers."

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[3] "The Farmer's Share: Three Measurements," *Agricultural Economics Research*, U. S. Department of Agriculture, Vol. VIII, No. 2, April, 1956.

[4] These data are published at least once a year. They last appeared in the July and October 1955 issues of the *Marketing and Transportation Situation* of the U. S. Department of Agriculture.

[5] This figure is so calculated as to eliminate (a) food sales not reaching domestic civilian consumers, and (b) imputed values of nonfood by-products.

(3) The total marketing-bill is the difference between consumer expenditures and farmer's cash receipts. This is called "aggregate marketing charges." It is the aggregate money value of all of the processes and services between the farmer and the consumer.

This marketing-bill series is a long way from a perfect measure, but it is a good starting point. As compared with the market-basket measure

TABLE 3. FARMERS' SHARE OF CONSUMER FOOD EXPENDITURES, 1939–55[1]

Year	Market value	Payment to farmers	Aggregate marketing charges
	Billion dollars	Billion dollars	Billion dollars
1939	13.5	5.2	8.3
1940	14.5	5.6	8.9
1941	16.9	7.1	9.8
1942	20.9	9.3	11.6
1943	23.9	11.4	12.6[2]
1944	24.4	11.6	13.3[2]
1945	26.8	12.6	14.9[2]
1946	33.5	15.7	18.3[2]
1947	39.2	18.7	20.5
1948	42.1	19.2	22.9
1949	41.2	17.1	24.1
1950	42.0	17.7	24.3
1951	46.9	20.3	26.6
1952	48.8	20.2	28.6
1953	49.4	19.3	30.1
1954	49.9	18.8	31.1
1955	50.8	18.3	32.5

[1] The market-value estimates are in terms of the cost of food bought by consumers at the various levels of distribution. They represent the cost of all domestic farm foods that were both sold by farmers and bought by civilian consumers in this country. Payment to farmers is adjusted to eliminate imputed value of nonfood by-products. The marketing bill is the difference between the market value and the payment to farmers, adjusted for processing taxes and government subsidies for certain years.

[2] Includes government subsidies.

Source: Adapted from Table 3, "The Farmer's Share: Three Measurements," Kenneth E. Ogren, *Agricultural Economics Research*, U.S. Department of Agriculture, Vol. VIII, No. 2, April 1956.

it has two very *important advantages*. (1) It takes into account the changing *types* of food and food services actually bought. (2) It takes into account changes in *volume* of food bought. When expressed in dollars, it provides a much more appropriate basis than does the market basket for measuring what farmers derive from the ultimate sale of food to consumers.

The major objections to the marketing bill—apart from the difficulties in collecting the figures—are that it is not a complete measure and that

it is not well named. It is incomplete in the sense that it deals only in gross figures; it answers no questions about net incomes or operating costs. It is poorly named because terms like "marketing bill" and marketing charges" emphasize the *expense* rather than the *value-creation* side of the food economy.

The Value-Added Concept

That brings me to the positive suggestion that the new measure we are hunting should emphasize the creation of economic values at every stage along the "Life Line." Farming, processing, transportation, wholesaling, retailing, and the other steps in getting food to cousumers, all *add value* to a product as it moves along the line. Years ago our economics courses provided us with a basis for making this sound idea simple and clear. We used to talk about the utilities of quality, form, time and place in a product. Any function that helped to provide these utilities to consumers was considered to be productively adding to its value. This is still sound economics, in my opinion and a key concept to be kept in mind in devising a new measure.

The various processes along the Life Line of America should be considered as *values added and not as costs* for values are added at every stage in the process. We can go to our local grocer (place utility) on any day in the year regardless of growing season (time utility) and buy a quality frozen or canned product in convenient packages (form utility) in the quantities we want ready for consumption. This packaged product has acquired much added value as it has moved through the channels of processing and distribution to the homemaker.

The value-added idea has long been used in statistical work by the Bureau of the Census, which has defined and measured the value added by manufacture. The figure is calculated for each manufacturing industry by subtracting the cost of materials, supplies, containers and contract work from the value of product shipped. This provides a measure of the economic values each manufacturing industry has created with its own labor and capital. It is used to compare economic importance of one branch of manufacturing with another. The term, value added by manufacture, is familiar to economists, and today's homemaker is becoming increasingly dependent upon such value in preparing her family's meals.

There is a related concept of value added by distribution. It also deserves some attention. Just as processing adds value to raw materials, distribution—making goods available when, where, as well as in the quantity consumers want—is also a basic value-adding function. A number of people have been promoting the term, value added by distribution, as a way of creating better public understanding of marketing functions.

R. J. Eggert[6] of the Ford Motor Company and the discussant for this paper is one of these.

If the value-added concept were applied to agriculture, it would measure the gross returns received by agriculture for its land, labor and capital excluding the cost of production materials and other services provided by off-farm agencies.

It would be theoretically possible to divide consumer expenditures for farm food products into the different value-added components that represent the gross returns of each industry or group for its labor and capital. Some of the principal industries or groups would be agriculture, food processors, transportation agencies, wholesalers, retail food stores and restaurants.

The major advantages of a *value-added* statistical series would be that it would *emphasize the productive role* of all aspects of the production, processing and marketing system. It would give a meaningful comparison of the economic importance of each segment of the Life Line chain—how much each had contributed to the final money value of the end product. It might be a useful refinement of the marketing-bill series, but it would still be an incomplete measure. It would not tell us anything directly about the equity of farmers' returns, or the equity accruing to other groups.

Therefore, I strongly recommend that the value-added *idea* and *name* be kept in mind in devising a new measure. I do not propose that the detailed statistical techniques of the value-added approach should necessarily be used.

A New Net Income Figure

This leads me to the suggestion that a vitally important part of our new measure should be improved net income statistics for farmers. Much of the criticism of the present market-basket figures stems from the fact that they are widely misinterpreted as an indication of the farmer's net income from his food operations.

None of our available farm income statistics apply separately to food operations and, by the same token, they do not take account of changing farm population in measuring this income. Beyond this, none of the present statistics distinguish between the marginal and part-time farmer, and the real commercial farmer. The plight of the marginal operators drags down the income figures for the whole group, obscuring the situation for those who are actually in the commercial farming business and who are reputed to account for about 85 per cent of the total agricultural output.

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[6] See "The Value Added by Distribution," by Robert J. Eggert, Market Research Manager, Ford Division, Ford Motor Company, a paper presented before the 19th Annual Convention of Super Market Institute, Cleveland, Ohio, May 8, 1956.

The position of the inefficient, subsistence farmer has two interesting parallels in the food distribution industry. He can no more compete with the up-to-date mechanized commercial farmer than the old five-story wholesale warehouse, using out-dated systems and hand methods, can compete with a streamlined one-story mechanized warehouse. He is about like the old fashioned Mom and Pop retail grocery store trying to compete with the modern super market.

Food processors and distributors are faced with increased labor rates, keen competition and the demand from consumers for reasonable food prices. Those who have successfully survived have been stimulated to make large capital investments in mechanization and to otherwise step up efficiency all along the line. The same is no doubt true in farming. Therefore I suggest we try to develop a farm income series applicable only to commercially operated farms; that it apply to food operation and that it be adjusted for changes in number of farm operators. This would be a truer measure of how well farmers are making out from the production and sale of raw foodstuffs.

Other Measures

Before concluding my remarks I should mention two other suggestions that have been made regarding a new measure. An economist for one of the country's leading food manufacturers has presented information showing a rise in the farmer's net dollar return per acre despite a decline in the farmer's percentage share of the manufacturer's unit selling price. This approach can be very helpful in dealing with specific individual company or product problems. General use of such a measure would depend upon obtaining adequate cost-of-production figures to use in computing net returns per acre.

A suggestion has been made by one of this country's leading agricultural statisticians that an index of the volume of services performed should be developed. This would undoubtedly have to include the quantity of services performed by each of the various parts of the food-producing and marketing industries. It would probably include man hours of labor used at the various levels and would also have to be related to the total economy.

Guide Posts for a New Measure

In summary what I have tried to show here today is that the well-publicized market-basket percentage measure of farmer's share and price spread is a misleading and outmoded statistic. I have also made a few suggestions about developing a new and better measure.

What we would like to see *now* is a thorough-going study of these market-basket statistics by a qualified and impartial group. If these experts should find that this measure is as outmoded and meaningless as

we at GMA feel it is, then we would like to see them initiate steps to have it discontinued by the Department of Agriculture. We feel that the case against the over-all *percentages* on farmers share and spread is so clear that such a group could reach an early decision on this point and make an almost immediate recommendation to discontinue these particular percentages.

Certainly the most important job of this group would be to find a new and improved measure. We think this measure should take into account the changing quantities and types of food marketed, changing consumer services built into the product, changing farm and industrial efficiencies and changing farm population. It should stress the dollar *values added*. It should *avoid* using percentage shares. It should provide information on the economic well-being of the *individual commercial* farmer on a *net* basis.

At GMA we are giving considerable thought to how a new measure might be constructed. We are working with GMA's Economic Advisory Committee which includes economists from many of this country's leading food manufacturing firms and we hope soon to have detailed recommendations. We do believe that the USDA's marketing-bill series—although still incomplete—is a superior measure to its market-basket series, and we are firmly convinced of the soundness of the value-added idea. If the marketing-bill and value-added ideas could be blended with a new figure showing net income per commercial farm operator from the sale of raw food products, we would really have a meaningful measure. We urge you to do some exploring of your own.

Meanwhile, until outmoded measures can be discontinued or a new measure can be developed, we urge the Department of Agriculture to explain its market-basket figures more fully to avoid further misinterpretation, and to give more emphasis to the marketing-bill series.

For our own part at GMA, we will continue to research and publicize a more complete set of facts on spread. Above all we will try to find an effective, simple and reliable substitute for the present marketing margin –farmer's share concept.

DISCUSSION: ECONOMIC IMPLICATIONS OF CURRENT TRANSPORTATION POLICY RECOMMENDATIONS

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Iowa State College

From the viewpoint of agriculture, Professor Locklin has ably presented the most important and most controversial sections of the Cabinet Committee Report; namely, the proposals relating to changes in rate stand-

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ards, those concerned with the classification of private and contract motor carriers, and those proposing further clarification of the agricultural exemptions of the Motor Carrier Act. There can be no quarrel with Professor Locklin's statement that "the interests of agriculture are identical with those of the general public so far as national transportation policy is concerned," but the trend of falling income in this area of our prosperous nation, coupled with the tendency of carriers to establish and maintain rigid rate levels on farm commodities, should create more than a passing interest among agricultural marketing people in recommendations that could ease the present burden of freight charges on agrcultural movements.

Pressures from many different quarters have prompted this widespread inquiry into national regulatory policy. Currently, one of the most important of these relates to the possible impact of large-scale public investment in our interstate highway system and in the St. Lawrence Seaway. Railroads view these developments with alarm, fearing a further disastrous effect on their declining share of intercity traffic, resulting in low rates of return on investment. Questions of carrier efficiency under the present system of regulation are being raised by shippers. Transportation economists are dissatisfied with a rate policy that prevents carriers from taking advantage of a low cost position. Finally, the low earnings of the carriers in prosperous times is a matter of concern to those who wish to see free enterprise preserved in the transportation field.

The competitive problem of the carriers is illustrated by Locklin in his discussion of the cumulative percentage railroad rate increases since 1946, and subsequent efforts to reduce many rates on specific commodities and movements. To those acquainted with rate practices, this technique is quite familiar. Rates are increased either by a straight percentage increase or a percentage increase with a "holddown." In those markets where the traffic can be held to the rail carriers, commodities will take the full percentage increases. Where competition is present, efforts will be made to reduce the rates on certain commodities or movements, or a maximum percentage expressed in cents per 100 pounds will be used. Of important agricultural movements, livestock, dressed meat, and grain traffic over long distances have taken full percentage increases, whereas fruits and vegetable movements have been subjected to the holddown procedure. Only recently has motor carrier competition compelled a re-evaluation of rate relationships in grain and dressed meat shipments, as has been necessary in relatively short-distance movements of livestock for some years. It is to this characteristic that previous reference to rigid rate levels was made. The fact that motor and water carriers have been successful in penetrating the high rated volume railroad market is borne out by the emergence of a strong private carrier

group, an increasingly effective contract carrier group, and the recent legislative curtailment of Commission power in motor carrier trip leasing arrangements. These developments have occurred as a shipper protest against high-cost, common-carrier transportation.

Transport legislation enacted in 1887 was designed solely to regulate the railroads. The spectacular rise of other forms of transportation made it necessary to revise this philosophy, and in 1920, 1933, and 1935, some attention was given to the rate relationship problems of the various agencies. However, not until the Transportation Act of 1940 did rate relationship matters arising from interagency competition receive legislative recognition. It declared that the policy of Congress was to provide fair and impartial regulation of all modes of transportation, administered as to preserve the inherent advantages of each. Although no attempt was made to define "inherent advantages," it must be presumed that the intent was the application of the economic standard or market relationships as the test. Since 1940, further competitive pressures have been generated against railroad rate structures. Thus proposals for the partial solution of the competitive problem have been centered upon the rate-making provisions of the Interstate Commerce Act.

Recommendations of the Cabinet Committee Report have been well summarized by Locklin. He lists two areas of disagreement. One objection concerns the failure of the proposals to recognize the wide latitude given the carriers by the Commission in adjusting rates to meet competition. This point may be well taken. If accepted, however, a further question persists. Why with this wide range of discretionary power in rate making has the Commission been unable to resolve a competitive struggle so intense in some cases that the economic structures of the carriers are seriously undermined. Perhaps it has been because of the failure to identify the competitive problem as one with two separate and distinct parts. Legislation designed to regulate intra-agency competition cannot be effectively used for the regulation of interagency competition since the services offered in the markets by each agency are not homogeneous. It is partially for this reason that proposals have been made to eliminate the phrase "effect of the rates on the movement of traffic" from among the directives given the Commission in effectuating the rate-making rules. Throughout the postwar revenue cases, it has been charged that the Commission has interpreted this clause so as to unduly restrict carrier management in their pricing policies.

The second area of disagreement discussed by Locklin refers to the recommendations curtailing the Commission's power of rate and discrimination control. To a limited degree, the proposals seek those objectives. The committee states that the rate control has been exercised in interagency cases so as to prevent the low-cost carrier from pricing on the

basis of its own true costs. Further, they state that a carrier, in spite of low costs, is not permitted to quote rates on these costs, but instead is allowed only to meet its competition on a rate-parity basis regardless of cost relationships. The standard suggested attempts to secure the privilege of making rates reflecting "cost advantages wherever they exist and to the fullest extent." The Commission would still have responsibility and power to see that rates are neither unreasonably high nor unreasonably low, the principal test being that they shall be compensatory to the carrier proposing them. The control over undue preference and prejudice would also be retained. The crux of the proposed rate policy is that no regulatory body can determine the proper economic sphere for each agency of transportation and each type of carrier within these agencies. Rather, the emphasis is placed on the market as the force to determine the division of traffic and for the efficient economic allocation of resources.

In our economic system, competition has always been ruinous to some firms and industries. Intense competition in transport within recent years has caused hardships among the various carriers and agencies. But to achieve the objective of efficiency of operation more freedom in market competition, rather than policies designed to curb its effectiveness, seems to be most logical. As long as a carrier charges a rate that is above the out-of-pocket cost of the service, thereby improving its revenue position relative to what it would be if the traffic was not carried, that carrier should be permitted to bid for the business. Public policy preventing such action can only result in further excess capacity with attendant discriminatory practices, inefficient use of resources, and a division of traffic on some basis other than cost standards. The proposals seem to offer the best opportunity to allow carrier management greater discretion in their pricing policies, thus giving greater promise for improvements in services. Their enactment should work to the best advantage of both the public and the carriers involved. However, a word of caution is in order. The criterion of market competition, if adopted even in a limited manner as the basis for a new rate-making policy, would require legislative recognition of the different cost characteristics of the various agencies. Because of the varying proportion of variable to total costs within the agencies, minimum profitable rates would differ. This is particularly true in the competitive relationships between railroads and motor carriers. The latter has a larger proportion of variable costs than the former and presumably would be permitted a narrower range of discretionary pricing. Unless this condition is readily appreciated, the criticism of Locklin deserves endorsement.

The final sections of this excellent paper are devoted to suggestions on reclassification of the types of motor carriers and the agricultural exemptions of the Motor Carrier Act. There are no areas of disagreement

between Professor Locklin and myself on his discussion of these topics. Common carrier service is regarded by the Committee as "superior" to all other types, and is emphasized as the "hard core" of the transportation system. In view of the obligations of a common carrier, this attitude is not difficult to understand. More difficult to comprehend is the attempt to protect common carriers from the competition of private and contract carriers. If, as suggested, competition is to be the force that determines the efficient use of resources, it is questionable that the common carriers can build the necessary sound economic structure by restricting the operations of private and contract carriers. Clear-cut legislative definitions of these important types of carriers would be a welcome addition to the literature of the transport field.

There is reason to be concerned with the recent tendencies to add processed agricultural products to the list of exempt nonprocessed agricultural commodities hauled by motor carriers. While engaged in a North Central regional poulty transportation study, we, at the Iowa State College, have had opportunities to sample opinions on this subject. You may recall that processed poultry was declared an exempt commodity by the Supreme Court within the past few months. Expressions of dissatisfaction with this decision have come from both shippers and common carriers. Shippers fear the loss of regular, efficient service, and their fears have been justified in some instances for common carriers have discontinued operations because of an untenable competitive position. Unless further clarified by Congress, the long-run effects of a continuing broad exemption policy could be harmful to the transportation system of our nation.

In summary, may I clearly state my position on these policy recommendations. It centers on the rate-making proposal, which after all is the heart of the Report. I firmly believe that the suggestions in this regard would, if enacted into law, be in the best interests of the carriers of each agency, and would benefit the public that is served.

DISCUSSION: SALIENT FEATURES OF RISING MARKETING COSTS

VINCENT I. WEST
University of Illinois

I find myself here in a rather peculiar position. Since I am in almost complete agreement with the material presented by Mr. Ogren, I had arranged my discussion on the general subject of the market-basket statistics and their general usefulness. I now find that Mr. Atchley has made most of the points better than I could hope to do.

In view of the careful analytical work in this paper and elsewhere by Ogren we may be sure that he is very well aware of the limitations of the data. However, in the hope that we may be able to bury the farmer's-share concept in the same crypt with Atchley's "middleman" I shall present the discussion as it was originally prepared.

Ogren has given us a dispassionate review of the way our marketing system has changed in increasing the marketing bill from 9 billion dollars in 1940 to 32 billion dollars in 1955. He has pointed out that most of the increase resulted from an increase in unit marketing coats and in volume of food handled. To my naive way of thinking his next sentence is perplexing. He says that a surprisingly small part of the increase is left as a residual after these two factors have been accounted for. This perplexity probably stems from my misunderstanding of the term, unit marketing costs. In a more general sense it is usual to consider total costs identically equal to unit costs times volume. This discrepancy is due to the fixed-amount-of-services concept of the market basket.

This group of introductory remarks should not convey the impression that I am dissatisfied with Ogren's paper. It is an excellent summary of a very important sector of the marketing economy. The fact that I chose a rather critical vein for this early position should rather be taken as an indication that I find this whole area of discussion rather confusing.

Although Ogren has referred only once or twice to the farmer's share (not counting footnote references) it is clear that the market-basket statistics are designed to measure the farmer's share and *incidentally* the unit cost of marketing. It seems rather regrettable that the best available measure of per-unit marketing costs should be based upon this unit which refers only to domestic farm-produced foods sold at retail and consumed domestically. In some sense it would seem desirable for the total cost of food marketing to represent the earnings of all resources in the country devoted to the handling, processing, financing buying and selling of food products. Such a measure would, of course, not facilitate measurement of the farmer's share. In respect to the latter my reaction is a very respectful "so what?"

It is carefully pointed out that hourly earnings do not constitute the cost of labor, freight rates do not constitute the cost of transportation, and profits per dollar of sales are not a general index of the profitability of a business. It is only in the one brief reference to the farmer's share, however, that a major reason for continuing market-basket studies emerges—to study the relative levels of utilization of *marketing* and *farm* resources for various commodities.

More specifically about the paper, I notice that Meek's tentative list of reasons for the increasing spread between retail and farm prices has been supplemented by built-in maid services at the grocery, and at the

restaurant, by the concomitant sales of "Genuine Man from Mars Totem Poles" and the like, and by costs incurred to offset the rising wage rates. Less emphasis is perhaps given to what might be called enforced maid service—that is, the increase in productivity of retail workers by getting the customer to do some of the work for *himself*.

Also, it appears that the farmer's share would have gone up in the last decade due to shifting food consumption if the farmer's share had not changed on any food category.

Finally, it should perhaps be mentioned that from the time Meek made his query the farmer's share was lower than it was in 1955, and that it was never more than one percentage point above the present level until World War II. Lest you may feel about me as Nixon did about the democrats, that I am reaching a long way back for something to talk about, let me say that my only reason for mentioning this is a reservation concerning the statement that this paper is dealing with "the salient features related to longer-term trends in rising marketing costs—rather than short-run fluctuations in market price spreads that often do not coincide with actual changes in marketing costs." It seems to me that the changes discussed refer mostly to the short run.

DISCUSSION: ALTERNATE APPROACHES TO THE MARKETING MARGIN–FARMER'S SHARE CONCEPT

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This problem can be placed in perspective by remembering that two basic economic problems are often confused in discussing the current agricultural situation.

The first is the farm income problem posed by rapid increases in productivity in the face of a much more slowly rising demand. The second may be stated as "Does distribution cost too much?"

Confusion arises by concentrating on the question of the "middleman" while forgetting that the farmer's welfare has been affected to a much greater degree in recent years by the dynamics of movement toward higher capital-labor ratios, by the temporary war-time necessity of feeding a large number of people outside the United States, and by the inherent instability of an industry with its output at the mercies of the weather while demands for most of its products are inelastic. Mr. Atchley is certainly on firm ground in insisting that the present farmer's share series says very little about whether or not distribution costs too much. He

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has also shown that the series is irrelevant to the problem of farmers' welfare.

Needless to say, I agree heartily with his support on the value-added concept, although I recognize that the problem posed in computing value added in the distributive lines is perhaps even more difficult than in application of the concept in manufacturing. However, I am sure the sampling experts of the Census Bureau and U. S. Department of Agriculture will be able to solve the problem of data collection once there is agreement as to the correct definition of the data.

I believe that Atchley's suggestion that an impartial group be appointed to reconsider the market-basket statistics is a good one. Perhaps this group should have a somewhat broader frame of reference than he suggests because, rightly or wrongly, these statistics have been taken as measures of the farmer's welfare as well as of distributive costs. We know that the farmer's welfare has been far more affected by the technological changes that have made the farm operation utilizing large amounts of labor relative to the amount of land and capital obsolete.

Organizations dealing with any aspect of agriculture should realize that here is the real farm problem and support efforts to solve this problem by getting many of these surplus agricultural families off the land and into more productive jobs. The impartial review group should perhaps turn its attention to the gathering and presentation of statistics relating to this problem as well as to the farmer's share of the market basket.

I am not in agreement with Atchley's specific suggestion that a statistical series be made up for the net income of the commercial farm operator from the sale of raw food products. It would obviously raise a ticklish problem of defining a commercial as opposed to a noncommercial farmer. I imagine that in some areas it would be difficult to apportion total cost between food and nonfood operations. Of course, such a series would also need to be adjusted for changes in the farmer's cost of living. However, if such a net income series were constructed, I would also like to see a series indicating farmers' rates of return on investment, for this would be a useful guide to the efficiency of the farm relative to other productive activities.

Income data of the sort suggested will be useful in evaluating the impact of changed technologies on farmers' welfare. However, we must recognize that such data would say nothing about the impact of technological changes, of changes in tastes and other dynamic elements on the efficiencies and values added in the distributive process. In passing, I feel that it is impossible to overemphasize the importance of these changes on food marketing activities. The distributor's traditional functions of producing time and space utilities, while of growing absolute importance, have

certainly been outstripped in recent years by production of form utility, by the growing importance of manufacturing food in the processing plant rather than in the housewife's kitchen. I am sure there is not a person here who cannot remember the pre-frozen-food days. We can also ask if other food producers have exhausted their opportunities. For example, has the dairy industry really begun to market milk and milk products? Have they taken full advantage of all the different market segments there probably are for this product?

In conclusion, I am sure that all of us are pretty much agreed on what is wrong with the present market-basket statistics and on the direction in which improvement lies. However, to gain acceptance of our ideas by laymen, by politicians, and by farmers, we will need to merchandise our ideas. Even so, I am sure that our heirs in the marketing field will face many of the same problems and questions that we have viewed today.

CONTRIBUTIONS OF ECONOMICS IN RANGE ECONOMICS RESEARCH

Chairman: M. L. Upchurch, Agricultural Research Service, U.S.D.A.

USE OF ECONOMICS IN MAKING DECISIONS RELATING TO RANGE USE

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BERTRAND RUSSELL reportedly initiated a game involving the conjugation of irregular verbs in a manner depicting man's curious propensity for self-righteousness: "I am firm; you are obstinate; he is a pig-headed fool. . . ." The American version of this game has reached a state of high skill in the area of range resource use and development. Editorial writers for *Harpers* magazine, the *American Cattle Producer*, the *National Woolgrower*, and the *Izaak Walton League;* members of the House and Senate investigating committees, representatives of the federal land administration agencies; spokesmen for sportsmen's organizations—yes, and even "unbiased" professional economists—all have shown varying skills in the art of the game.

Part of the ingredients of this game are derived from differences in the honest estimates of physical production responses under alternative courses of action. Objective research designed (1) to improve the tools for estimating physical production responses, (2) to yield physical production data in terms amenable to economic analysis will do much to eliminate some of the conflicts and confusions that are apparent in this area. For a number of reasons—which we hope to spell out during this session—these estimates are especially attended with uncertainty in the Western range area.

The second part of the ingredients of this game is due to differences in individual preferences, or—what is more critical—due to different objectives and value systems that exist among the users of these resources. Among the apparent goals in the use of range resources are such conflicting items as (1) maximizing the number of people on farms and ranches, (2) obtaining a climax forage species on each range site, (3) maximizing the number of deer, (4) reducing current rates of resource use, or (5) maximizing farm income. Agreement as to means must await a more general agreement on objectives. Economics can and, I think, is playing an important role in more clearly defining the ultimate objectives of resource use and in distinguishing between ends and means.

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I would like, for a moment, to describe three different types of decisions where economics (or lack of it) plays an important role. First are the decisions made by ranchers, whose level of aggregation is the firm, and whose objectives generally are harmonized with profits. Secondly are those decisions made by public land administrators, whose level of aggregation includes the affected public and whose objective is, in some ideal but abstract sense, to maximize welfare in terms of preferences of the people concerned. Thirdly are the decisions made by range researchers in their formulation of hypotheses, their design of experiments, surveys and statistical tests, and in their interpretation of the results. In the dynamic setting that characterizes Western range resource use, economics conceivably could play its greatest role in this foyer.

I distinguish among these three areas of decision making not because a different kind of economics is required for each. Rather the economic theorems and framework would be essentially the same for all three. Even though in economic skeleton form they are basically the same (and I believe this conclusion, in itself, is an important contribution of the science) nevertheless, when the skeleton is "filled out" with the physical phenomenon and choice criteria, and when the problems are considered over the economic horizons which are meaningful to each, important differences appear, which, I think, warrant their distinction.

For the most part, both the discussion and work associated with range research in the past has been directed toward measuring physical phenomenon. The processes by which these parameters are estimated are made complex by the lengthy time requirements for production response to changes in production practices. In the absence of research to help him, a rancher has a difficult time collecting sufficient observations during his lifetime to give stable estimates of parameters that are relevant to decision making. Some of the research currently underway in W-16 (the current regional range research project) will help to reduce the uncertainty of these estimates. Furthermore, the two following papers are addressed to this problem of using economics to improve our tools for estimating physical production responses in terms that are amenable to economic analysis. I, therefore, will try to concentrate somewhat more on the other leg of the equation, *viz* the choice indicators.

I believe the discussion will be more to the point if the issues are discussed with reference to specific examples of decisions that have to be made. There are many different examples that could be chosen. I have selected two, both of which are only illustrative.

For the first example, consider the case of a rancher who runs both sheep and cattle on a mountain valley ranch with mountain summer pasture. He seeks an answer to this question: How can he best allocate a given quantity and composition of range forage between cattle and sheep

so at to maximize his net income? Not so long age, the answer to this question was simple. A range was either sheep range of cattle range—not both.

Recently however, range management experiments have shown what many ranchers have come to know—that more animal units can be grazed with sheep and cattle combined than with either grazed separately. I have in mind particularly, an experiment by Wayne Cook of Utah.[1] His conclusions were based on his study of the vegetational composition of the range and the per cent utilization of each plant species by sheep and by cattle. The forage factor for sheep and for cattle was estimated for each species. The aggregate forage factor was computed to be .2034 for sheep and .3728 for cattle. However, if the higher forage factor for either cattle or sheep is used for each plant species the total becomes .4339. Cook used this figure to represent the forage factor of common use, and estimated a total grazing capacity of 652 animal units for that combination where 422 animal units of cattle and 230 animal units of sheep were being grazed. This compares with his estimated carrying capacity of 560 animal units when only cattle were being grazed and 306 animal units when only sheep were being grazed.

Curve A of Figure 1, illustrates the constant marginal rate of substitution of traditional management practices (MRS = 306/560 = .546). Cook rightly discredits this idea by estimating one central point on the transformation function. However, he then proceeded to determine the intermediate points by linear interpolation. Cook's hypothetical transformation function is demonstrated by Curve B.

The logic of both economics and range management does not support the hypothesis that the marginal rate of substitution of cattle for sheep remains constant at a low rate (.177) up to a certain point and then suddenly increases to 1.674, remaining constant at the new level beyond that point. Rather it suggests that when all, or most, of the livestock are cattle, a few sheep might do fairly well on those species that cattle do not utilize. At the other extreme a few cattle might do well on those species for which sheep show little preference. In between these two extremes, cattle and sheep become competitive for the important forage species. Curve C is suggested as a more realistic picture of the substitutional relationship in question.

Given three alternative assumptions, A, B, and C, the critical values of which were determined by the same process, I suggest that a rational choice from among them must be C.

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[1] Wayne Cook, "Common Use of Summer Range by Sheep and Cattle," *Journal of Range Management*, 7: 10-13 and John A. Hopkin, "Economic Criteria for Determining Optimum Use of Summer Range by Sheep and Cattle," *Journal of Range Management*, 7: 172-175.

Both cattle and sheep (and their products) are exchanged in the market, so that market prices reflect the relative preferences of society for these products. Only rarely, if ever, would the ratio of the price of steers to the price of lambs be used, however. In its simplest form, one likely would have to adjust market prices to correct for differences in marginal costs arising from the fact that more labor is usually required for sheep than for cattle. Based on data contained in *Agricultural Information Bulletin 128*, June 1954, an animal unit of sheep on a family-operated sheep ranch in the Northern Great Plains yielded a return net

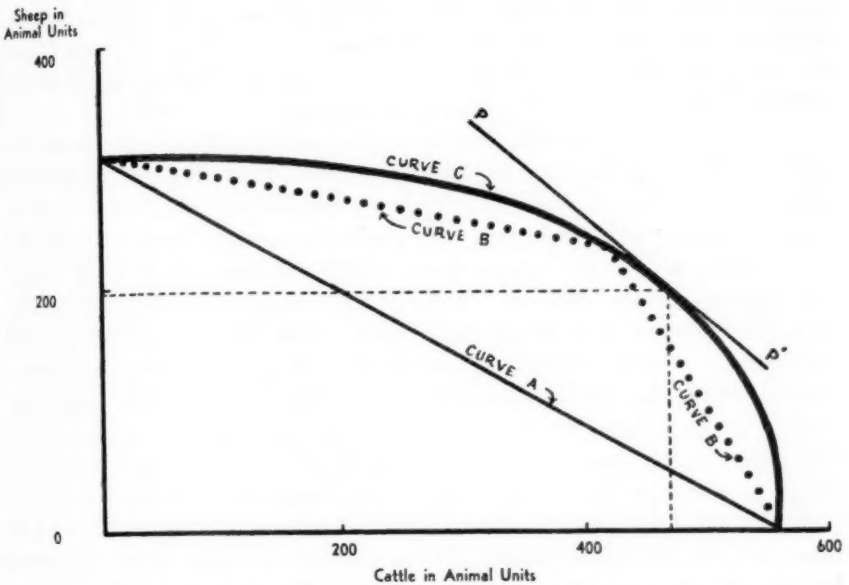

FIG. 1. COMBINATIONS OF SHEEP AND CATTLE ON 2,800 ACRES OF RANGE LAND IN THE WASATCH MOUNTAINS

of cash expenses of about $16.00, compared with $13.00 for an animal unit of cattle. Using this adjusted price ratio of .813 the combination of cattle and sheep on this range that will maximize profits is 197 animal units of sheep and 470 animal units of cattle.

Where there are important economies of scale associated with different combinations of cattle or sheep more detailed calculations are required either by budgeting or by linear programming. But the problem is still essentially the same—and so are the characteristics of the answer. An erroneous idea has crept in from somewhere that in order for an economic model to be of value the problem must be neatly solvable with geometry. In nearly all cases the answer is computed arithmetically, algebraically,

or with higher mathematics—almost never with geometry. But this does not diminish the importance of the economic model, which may not be simplified and reducible to geometry without moving into the realm of fiction.

Consider, as a second example, the problem faced by a public land administrator of determining the most desirable combination of domestic grazing (cattle) and wild life (deer) on a particular national forest. Of course, we can assume that long-run experiments have been conducted which will provide estimates of the iso-resource curve for these two products. But more realistically, we will have to initiate a research program that will eventually yield reliable estimates. In the meantime, however, decisions have to be made based on our best estimate (1) of the marginal rates of substitution between these products, and (2) of the relative preferences of society for cattle and deer.

I submit, again, that economics can play a very significant role at this point in directing the form of these estimates. Whereas most public land administrators tend to view the product-combination possibility curve as a single point, and sportsmen and cattlemen groups tend to view the relationship as purely competitive, both economic logic and range management theory prescribe that for most range sites the relationship will be somewhat as suggested in Figure 2. The model suggests that OC deer can be carried without supplemental feeding. This number will keep most of the forbs, herbaceous shrubs and other browse-type vegetation grazed down fairly well, but will leave enough summer grass so that OJ cattle can be grazed without materially affecting the condition of the range or the deer—in other words, a supplementary relationship.

At the other extreme a maximum of OG cattle can be grazed when OH deer are on the same range. If the number of deer were cut much below OH, the amount of shrubs and underbrush likely would increase with a corresponding decrease in the quality of forage preferable to cattle, so that the maximum number of cattle would ultimately decrease.

I would argue that on a specific range a few critical points on this substitution curve can be estimated with no greater difficulties—and with more relevance—than the single points or straight lines we have been used to. Furthermore, I believe they would have the advantage of being logically sound and therefore of being subject to genuine refinement as research information was forthcoming.

But what about the other side of the maximizing equation? Since deer are not sold in the market, there is no market price and hence no readily available expression of peoples' relative preferences for cattle or deer. However, so long as free individuals are assumed to be the best judge of their own needs and wishes, the relative importance of various goods and services to society can be measured best by the amounts of other

goods and services that the members of society are willing to give up in order to obtain the first. Thus, it seems to me, expenditures that people make in pursuit of wildlife as compared with expenditures made for other goods and services represent our soundest basis for comparing the contribution of each to society's happiness and welfare, provided the total number of issued hunting permits is sufficient to reasonably meet the demand at that cost.

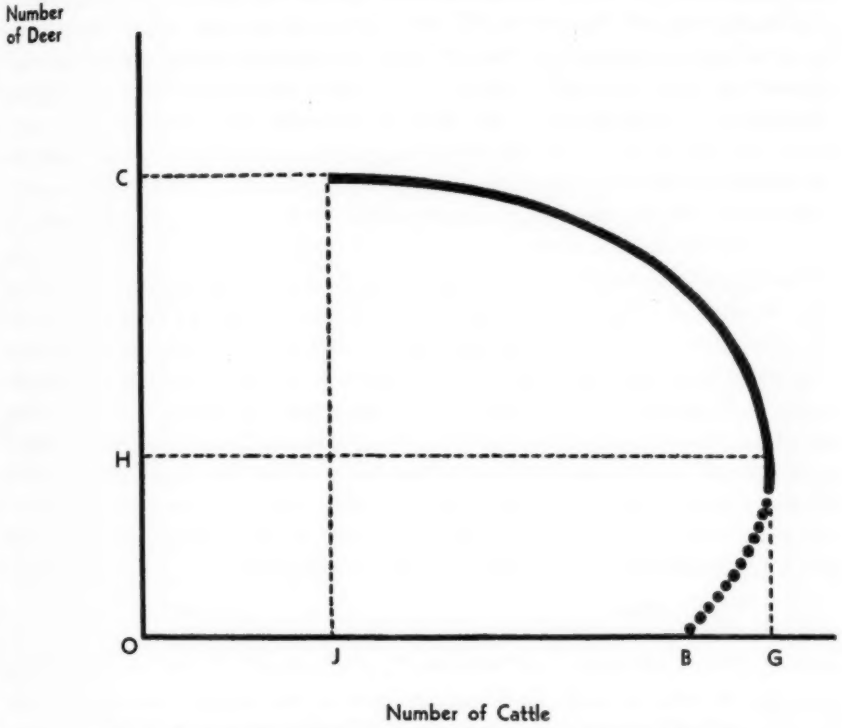

FIG. 2. COMBINATIONS OF CATTLE AND DEER ON A HYPOTHETICAL MOUNTAIN RANGE

The procedure for estimating expenditures associated with hunting deer on a national forest need not be formidable. In the first place the "universe" can be defined, since all legal hunters are registered when their licenses are purchased and they can be checked when entering or leaving an area open to hunting. Information could be obtained concerning all expenditures relating to the hunting trip—license, travel, food, etc., as well as investment in special chothing, hunting and camping equipment on which annual depreciation should be charged. Total annual costs could be readily converted to a price per head of deer produced in the forest. This price can then be compared with weighted local market

prices of cattle to yield a price ratio which is our best estimate of the relative preferences of society for deer and cattle on that national forest. Likely, the price ratio would have to be adjusted to reflect differences in marginal costs of cattle and deer arising from resources used specifically for each, but these estimates can be made for each situation.

Under conditions of severe rationing of hunting privileges the above would be less useful since rationing and price fixing tends to prevent the market from reflecting the economic value of a commodity. Evidence of heavy demand in excess of the supply of rationed hunting permits means that our procedure has underestimated the relative preference for deer. This fact, in itself, might be the basis for a quantitative judgment by the land administrator when making his decisions.

In the policy issues of the Western range we have some real problems of political economy. Here are important problems of social choice, and economics should be given an important role in the process. Many of these decisions are made by delegated representatives of the people. Although the process of delegation was at first envisioned as one where the delegators (the voters) had direct contact with and control over the decision makers (since they would be their elected representatives), a vast and growing (and, for the most part, a highly competent) bureaucracy is becoming more and more important in this decision-making process. Not only do the administrative bureaus formulate the details of policy as it is carried out; frequently they write the legislation, subject to the approval or disapproval of Congress and the President. Congress does have control of the purse, however, which is its most effective control of the bureaus—as the Forest Service and Bureau of Land Management have come to know.

Thus we have placed important decisions with persons who are not choosing for themselves. Because of the complexity of the decisions it has become imperative that we do so. But one of the limitations of economizing through delegated decisions is the difficulty of communication. Given the relative scarcity of resources and the available alternative uses of these resources, the people need to make their relative preferences known to those who make these decisions. The roll that economics has played in delegated decisions has been less than it might have been had these preferences been made known. True, we have pressure groups that serve as mechanisms through which specialized groups may make their preferences (and strength) known at several stages in this delegated decision-making process. But there are lots of important folks who are not politically activated into pressure groups. Are their preferences to be ignored in these decisions?

I would like to emphasize again that the preferences of individuals frequently can be expressed through the price system or can be measured

in monetary terms. This procedure will be reasonably accurate (1) when the products to be allocated, even when rationed, are in sufficient supply to meet the bulk of demand at the specified price, (2) when the important costs and returns to individuals and firms can be evaluated in monetary terms (as discussed earlier, the product need not enter the market), and (3) when the contemplated change is relatively small. This latter point is based on the supposition that radical allocation change probably will affect the distribution of income sufficiently that the decision must be considered from that standpoint, also. There is still the problem, then, of what to do in those instances where the price system cannot be used.

Society holds some products from the range at such high values that they cannot be expressed in monetary terms—flood controls, for example. These values enter the decision-making process as constraints against those alternatives that would knowingly increase the danger of downstream flooding. But this kind of product is relatively rare, also, except for flood control.

We hear frequent reference to direct voting as a means of reflecting individual preferences among alternatives. Voting is a process by which the qualified citizens of a community express their first preference between or among alternatives. It will reflect the preferences of individuals provided (1) that the appropriate alternatives are defined and communicated to the people, and (2) that the alternative courses of action are specifically identified with the alternatives of voting. Only rarely, however, are the alternatives of state and national issues clearly defined when they are associated with the voting alternatives in a two-party system. As a consequence voters can seldom express their preferences among alternatives by voting.

A supplement to the price and voting mechanisms as tools for estimating the preferences of a community would be a preference survey, where the alternatives would be explained in detail to a selected sample of individuals and their relative preferences recorded. From the relative preference of the sample, inferences could be made concerning the preferences of the population. The nature of the questions to be asked, the individuals and/or groups that should comprise the universe, and the method of aggregating the preferences would depend on the nature of the allocation problem in question. Where individual preferences for specified quantities of goods and services are expressed in terms of what each one would be willing to give up in order to achieve it, the results contain more information than where a mere statement of preferences is obtained.

The services of professional statisticians, psychologists, and trained enumerators would be required to insure that the individuals being sampled could think and respond in the terms of the questions being

asked. I believe it would be possible to obtain a statistical sampling service that could achieve the same high degree of competence and objectivity that has characterized research institutions generally. Logically, it would be a part of the Bureau of Census—which, by the way, is now using the sampling technique to evaluate the accuracy of its enumeration. The information obtained through the preference sampling service would be used along side information obtained from other scientists (of both the social and physical varieties) in making decisions regarding resource allocation.

The extensive use of preference sampling would have some interesting implications, so far as public land administration is concerned. For instance, the present practice followed by public land agencies of using rancher advisory boards might be materially affected. The need for the advisory boards as a means of obtaining the "grass roots" opinions of the various segments of the economy would be diminished. On the other hand, the advisory boards could become better informed concerning the preferences of the group they represented, and could speak with greater certainty. It would seem advisable, under these circumstances, to revise the advisory boards; first, to have them include representatives of all important users of the resources in question rather than just the stockmen as is presently the case; and second, to give the advisory boards a greater influence in determining the policies and practices governing the use of the resources.

The use of direct sampling of community preference would no doubt have some interesting effects on the activities of pressure groups, also. The administration's need for the "services" of the pressure groups would be almost eliminated. Should a preference sampling procedure become effective, the efforts of the pressure groups likely would be redirected toward influencing the desires of the citizens. This is precisely what is being done in those cases where the preferences are expressed directly at the voting booth (this effort takes the form of campaigning), or where they are expressed indirectly in the market place (here the pressure takes the form of advertising). Actually, the activities of pressure groups directed toward the citizenry would be a form of advertising—i.e., describing to the public the alternatives of the public resource allocation problem in such terms as to make one alternative seem more desirable than another. It seems to me that the extent and the direction of influence of pressure groups could be more nearly assessed and controlled under such a system than it can at present.

Conclusions

By way of summary and conclusion, I would like to make four points:

First. In those instances where experience and scientific research are sufficiently developed to establish fiducial limits on the expected functional relationships and the expected preference ratios, the marginal conditions of economic theory specify rather precise solutions to the resource allocation problems. We should be quick to emphasize, however, that these instances are rare in the Western range area.

Second. For most of our problems scientific research has been inadequate or it has not been designed to furnish the kind of information needed for economic analysis. Sometimes experience is entirely lacking, or a particular alternative or experience may be available only over such a broad range of circumstances that verification of response is impossible. Under these situations the maximizing solution to a given problem becomes merely a construct—a theoretical norm. There are obvious and significant uncertainties associated with it. This solution is important only in an *ex ante* sense, since no testable *ex post* conditions exist. In these cases, also, theoretical economic models become particularly useful. In the first place, they specify the information needed for an ideal solution; and secondly, they prescribe the statistical procedures to be used in collecting and evaluating the information. However, there are many of these problems for which we do not have sufficient information to make precise solutions where decisions and action cannot be delayed until research findings are forthcoming.

Third. Under such circumstances the logic of theoretical economics provides our soundest basis for action. *These decisions are going to be made* and I believe that as economists we should be less timid than we have been about the role economics can make in guiding these decisions.

Fourth. Economic analysis of range *lands* only is not sufficient. In the past we have been overly narrow in our approach by considering the economics of range resources as a land problem. All resources that have alternative uses must be considered. Labor and capital usually are not fixed in location and consequently present greater opportunities for alternative allocation than do most range lands. Therefore, one might argue that economic analysis of labor and capital is more meaningful than economic analysis of land in the Western range area. Economic logic, however, dictates the need for considering all scarce resources available to the area.

ECONOMIC CONCEPTS IN DIRECTING AND DESIGNING RESEARCH FOR PROGRAMMING USE OF RANGE RESOURCES*

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TECHNIQUES and principles from economics can be used in range management to indicate (1) problems of greatest significance for physical research and (2) designs allowing the results from experiments to be incorporated in a decision-making or profit-maximizing framework. Both uses of economic principle are outlined in this paper since selection of the research problem is as important as selection of the design or empirical method. The purpose of this paper is not to indicate specific range problems for research, but rather (a) to provide one framework for selecting important problems and (b) to employ a few economic principles in illustrating how different designs may result in different economic conclusions from research in range management. This short paper necessarily leaves important gaps. Because of limited time we mainly leave variability and uncertainty, perhaps the foremost ranch management problems, for a later analysis. Too, we focus on problems of the ranch firm; supposing that we can deal later with research of significance to the consuming society; though obviously the two are not entirely distinct.

Programming Approach

Linear programming is a convenient (though obviously not the only) technique for designation of research areas of greatest importance. The topic of this paper is physical research, and the emphasis will be accordingly. Assumption will be made that the land area is limited; since it is for all ranches, even though one rancher may have capital to acquire more of the fixed supply from others. Hence, land will not be considered as an element in the resource matrix; but feed produced from land will be. Limitations in physical resources then are feed supplies in particular times of the year; although if we wish, we can add such things as water (in contrast to land) supplies which have the possibility of being increased in quantity. Physical resources thus become those that can be generated from land. We prefer to view the problem in this light since, while ranch land supply cannot be increased, possibility exists for increasing the resources generated from land. This is the important opportunity for increasing marketable livestock products and ranch profits through physical research. The elements of the activities matrix can include various types of beef or sheep including a separate activity for each age, grade or breed of animal, or for animals sold from the range at different times of the year.

Viewed through the technique of linear programming, the problem of the

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ranch firm is to select values of elements in a matrix (X) of activities which, multiplied by the transpose of the vector of net prices, will give a greater profit than any other ranch program.

$$\text{maximize } f(X) = c'X \tag{1}$$

Restrictions of (2) and (3) necessarily limit the ranch program that can be selected and begin to provide the framework for indication of significant research problems.

$$PX = B \tag{2}$$

$$X \geqq 0 \tag{3}$$

In (2), we indicate that the matrix of input-output coefficients multiplied by the matrix of activities must equal the matrix of resource restrictions for the ranch. The matrix X can be partitioned into two submatrices: X_1, levels of disposal activities initially included in the program (or those later representing feasible activities to be examined for profits), and X_2, levels of activities which initially are at zero level but can be considered as alternatives in the program. Similarly, we can partition P into P_{11}, whose elements are input-output coefficients for X_1, and P_{12} whose elements are input-output coefficients for X_2. From these steps and from (2), it is obvious that both sets of activities are limited by the restrictions of the ranch contained in the matrix B.

$$P_{11}X_1 + P_{12}X_2 = B \tag{4}$$

$$P_{11}X_1 = B - P_{12}X_2 \tag{5}$$

$$P_{11}^{-1}X_1 = P_{11}^{-1}B - P_{11}^{-1}P_{12}X_2 \tag{6}$$

$$X_1 = P_{11}^{-1}B - P_{11}^{-1}P_{12}X_2 \tag{7}$$

As equations (5), (6) and (7) indicate, the amount of any one activity that can be produced under these restrictions is a function of (i.e., the opportunity cost is expressed through) the input-output coefficients in its own P matrix and the level of other activities. We later relate these matrices to physical research; to indicate optimum ranch organization and possible scale or volume from a given set of resources or restrictions.

$$f(X) = c'X = c_1'X_1 + c_2'X_2 \tag{8}$$

$$f(X) = c_1'(P_{11}^{-1}B - P_{11}^{-1}P_{12}X_2) + c_2'X_2 \tag{9}$$

$$f(X) = c_1'P_{11}^{-1}B + (c_2' - c_1'P_{11}^{-1}P_{12})X_2 \tag{10}$$

Given the notations above, we can express the profit function as (8) and hence (10). The matrix X_2 includes possible activities that we may wish to include in the ranch plan. Given the prices, resource restrictions and input-output coefficients, profit then becomes a linear function of the activities in

the X_2 matrix. However, from the standpoint of physical research, the important focus is on the elements of B, P_{11} and P_{12}, which are considered as constants in programming. The elements of X are themselves a function of the elements of B and P. The elements of X, and profit if some elements in c are greater than zero, can increase only if elements of B are increased or elements of P are decreased. Given the techniques represented in the P matrix, the amount of profit possible for the ranch firm is limited by the restrictions in B. Any "lifting" of the magnitudes in this matrix can increase the profits available to the firm. Hence, one important area of physical research has been designated. However, it is not equally important that all such elements be changed. Physical research and the allocation of experimental funds should be ordered accordingly. To suggest the order of needed physical research, we need to examine the elements of these two matrices.

The elements of B represent the three somewhat distinct types of restrictions that limit profit to the rancher. We can define b_1 through b_h as institutional restrictions such as water rights, tenure arrangements and

$$(11) \quad B = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_h \\ b_{h+1} \\ \vdots \\ b_k \\ b_{k+1} \\ \vdots \\ b_m \end{bmatrix} \qquad (12) \quad P_{12} = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1n} \\ p_{21} & p_{22} & \cdots & p_{2n} \\ \vdots & \vdots & & \vdots \\ p_{h1} & p_{h2} & \cdots & p_{hn} \\ p_{h+11} & p_{h+12} & \cdots & p_{h+1n} \\ \vdots & \vdots & & \vdots \\ p_{k1} & p_{k2} & \cdots & p_{kn} \\ p_{k+11} & p_{k+12} & \cdots & p_{k+1n} \\ \vdots & \vdots & & \vdots \\ p_m & p_{m2} & \cdots & p_{mn} \end{bmatrix}$$

grazing rights. Elements b_{h+1} through b_k represent such restrictions as labor supply, monetary funds and purely subjective and uncertainty restrictions that the rancher or ranch family attaches to the plan. Elements b_{k+1} through b_m represent purely physical restrictions; such as the amount of grass produced in each month of the year or available for winter range, the amount of hay produced on hayland, the effective application of water available, and so forth. The elements of P are the corresponding requirements for the activities $X_1 \cdots X_n$ which must be produced under these three types of restrictions, and these elements form the last group of restrictions to which physical research is or should be directed. If profit level is limited by the first two categories of restrictions, (i.e., disposal activities are greater than zero for all physical restrictions), physical research cannot be helpful in increasing profits of ranchers. Research needs to focus (1) on

legal, sociological and other mechanisms to help lessen the institutional restrictions and (2) on economic analysis to suggest how the limitations in capital and labor can be removed; or how such subjective restrictions is uncertainty can be lessened. Perhaps the prior function of surveys is to determine whether or not the elements of institutional restrictions, b_1 through b_h, the "more nearly" economic restrictions, b_{h+1} through b_k, or the physical restrictions, b_{k+1} through b_m, limit profit.

Priority in Physical Research

Priority should be given to physical research in terms of the extent to which the latter restrictions limit the scale and nature of the ranch program. If disposal activities with final levels greater than zero are required to cause the requirements in the profit-maximizing plan to equal the supply of the particular physical resource, then research should not be devoted to this particular area as long as resources exist where the activity requirements, excluding slack variables, equal the resource supply. For example, if forage supplies in August limit the scale of operations, research should be devoted to lifting this restriction; rather than to increasing grass supplies in June or throughout the season.[1] However, once techniques have been discovered for increasing August grass supply, physical research should be shifted to other areas of resource restrictions that limit the scale and nature of the ranch program. If limits to stocking now become winter forage, research should be shifted accordingly. Winter forage restrictions might be increased by introducing new species, improved grazing or stocking management, more effective use of water supplies in producing hay (i.e., in converting the fixed supply of water allowed by institutional restrictions to a greater effective supply, as it reaches the land, through improved irrigation methods), etc. In all cases, we suppose that research must result in discoveries wherein physical restrictions can be lessened, with the marginal cost of increasing the resource supply being less than the marginal value product produced from it. If capital represents one restricting element of the resource matrix, the method used in increasing the supply of a particular resource should be one giving the greatest return per dollar invested by the rancher.

Thus far we have mentioned research to remove particular restrictions. Here we view each element of the B matrix separately, and if August grass is limiting, ask about methods of increasing the supply through forage species, stock management, etc. In the first equation of the programming

[1] Of course, where June grass and August grass are technical complements, the two would be increased together, even if the focus is on August supplies. The important point is that research should not be directed at total season production, but more particularly at the period in which the deficit exists. Where the growth of one month or season can be stored, the solution may then lie in increasing total production throughout the season, with a "storage activity" to carry the surplus to the deficit period, as is outlined later.

framework in (13), for example, we would concern ourselves only with the magnitude of b_1. We would ignore all p_{ij}, X_j and other b_i values. This procedure leads to the types of physical research already mentioned. However, another method exists for lifting the restrictions imposed by any b_i. It is to add another activity that relates two elements in the restriction matrix. The possibilities here can be illustrated by comparing the two sets of equations (defining the relationships between activity levels, resource requirements and resource supplies) in (13) and (14).

$$\begin{array}{l} p_{11}X_1 + p_{12}X_2 \cdots + p_{1n}X_n = b_1 \\ \vdots \qquad\quad \vdots \qquad\quad \vdots \qquad\quad \vdots \\ p_{m1}X_1 + p_{m2}X_2 \cdots + p_{mn}X_n = b_m \end{array} \tag{13}$$

In the first set of equations, we only suppose that one X_j represents a disposal activity or slack variable corresponding to a particular b_i or resource restriction. It has a positive p_{ij} coefficient of unity for the particular resource restriction (but of zero for other resource restrictions).

$$\begin{array}{l} p_{11}X_1 + p_{12}X_2 \cdots + p_{1n}X_n - p_{1n+1}X_{n+1} = b_1 \\ \vdots \qquad\quad \vdots \qquad\quad \vdots \qquad\quad \vdots \qquad\quad \vdots \\ p_{m1}X_1 + p_{m2}X_2 \cdots + p_{mn}X_n + p_{mn+1}X_{n+1} = b_m \end{array} \tag{14}$$

Now to bring in other alternatives for research direction, we add the variable X_{n+1} and obtain the set of relationships in (14). With a positive coefficient for this activity in the equation of b_m and a negative coefficient in the equation of b_1 we are able to transfer any surplus of the former resource to the supply of the latter. In ranch operations, this would mean (in contrast to the previous approach of increasing b_1 apart from b_m) adding a "storage activity" for using grass produced in June during the shortage of August. More important it would consider such things as methods of producing forage during the summer, to be used during the winter.

The two types of research outlined above—(1) increase b_1 any apart from other restricting elements of the resource matrix, or (2) transfer the surplus under one element to the supply represented by another—lead mainly to treatment of the land, forage-storing methods, development of higher-yielding species of forage, and irrigation methods. A final "distinct" procedure for lifting limits to profit is research to lessen p_{ij}, the magnitudes of elements in the input-output matrix. With the b_i values taken as constants, profit then can be increased, by allowing the magnitude of cattle or sheep activities to increase proportionally to the decrease in p_{ij} for the restricting resource. Generally, the important types of research making for these changes include improved breeding, stocking management, wintering meth-

ods, age combinations and other practices with animals that allow greater gains from given forage supplies.[2] Again, however, lessening of all p_{ij} is not equally important. The coefficients that should have priority on research funds can first be designated by row in P_{12} of (12). Rows should be selected for research only where the corresponding element of B in (11) restrict the program. If b_1 through b_k serve as the only restrictions, no research would be devoted to p_{ij} corresponding to b_{k+1} through b_m. Generally the column item or element of the row selected for research, using the above criterion for selecting the row of P_{12} for research, would correspond to the element of X for the $c_j'X_j$ that is greatest. However, this need not be a *universal* rule; because important innovations may change the $c_j'X_j$ that is greatest, given the restrictions in B.

Research planning

The framework outlined above might possibly be used jointly by economists and physical scientists in planning the most productive or promising lines of research. With "rough estimates" (i.e., "quantified" hypotheses), prior to the experiments, of the magnitude by which feed supplies or requirements respectively might be increased or decreased from the above categories of research, these quantities could be put in the P, X and B matrices, with the most profitable ranch organization programmed accordingly. The procedure might be first, to program organization and profits under techniques already known. The physical resources serving as restrictions to profit first might be selected for research. One criterion for selecting the most important ones would be the calculated marginal value products on the final program (i.e., the largest $z_j - c_j$ value in simplex analysis). Then the "quantified" hypotheses of prospective techniques (i.e., new activities defined by new input-output coefficients) might be inserted separately into the matrices; to indicate the order by which they increase profits. Or, all prospective techniques might be put into one programming problem, with "prospective techniques" remaining in the final solution being those on which to conduct research. Those activities ranking low in the "order of profits," or not remaining in the final solution (as well as restricting re-

[2] If it is not known that profits will be greater using the new technique, a new activity or variable should be added to each equation of the system. Programming then can be used to indicate the most profitable method for the particular enterprise, as well as the general organization of ranch activities. However, if it is obvious that the new technique for a particular enterprise is more profitable than the old one that it parallels, the column of input-output coefficients in the old P matrix can be "lifted out," with the column of new coefficients replacing it. Programming then can be used to determine the most profitable general ranch organization, including a particular enterprise more profitable than the alternative it replaces. In all of these statements, we suppose that the sum of the costs represented by the p_{ij} values in any column is less than the value of the unit of X_j they produce.

sources with low value products), would be held in abeyance.[3] The coefficients used would only be *ex ante* "quantified" hypotheses, and the *ex post* results might prove or disprove their magnitudes.

To be certain, groups of cooperating scientists could not give a set of *ex ante* estimates conforming 100 percent with the *ex post* experimental results. However, as long as the score on the correct order of estimates is better than 50 percent, this systematic procedure for organizing research (i.e., indicating which research should be conducted from limited funds)

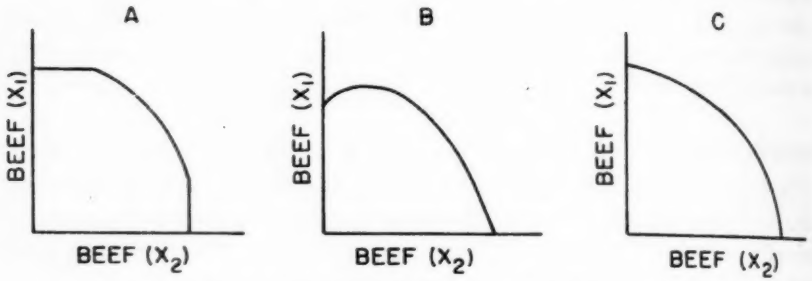

FIG. 1. ALTERNATIVE PRODUCTION POSSIBILITIES

would be preferable to having workers in a large number of fields pursue their own scattered directions. Too, it would allow comparison of the need for experiments on prospective new physical techniques, with research relating to institutional or economic restrictions. The programming solution using the "quantified" hypotheses of physical techniques might show these to be "prospectively profitable" but that institutional and economic restrictions determine the final level of returns. Research on the latter then should be conducted concurrently with experiments that test the "quantified" hypotheses of the selected physical techniques.

Research Design

Economic concepts also can be used with physical research in designing particular studies. We illustrate possible uses of two sets of concepts, although numerous others are applicable. In range management economics it is important to know the extent to which enterprises (whether enterprises or activities are defined so distinctly as sheep and cattle, or as beef produced specifically at different times of the year or in different years) are supplementary, complementary or competitive. These relationships are represented geometrically in Figure 1. In A, the horizontal and vertical portions of the opportunity curve indicate that beef might be produced at one time

[3] These statements are in terms of return on resources invested in the technique and its empirical effect on productivity after it has been discovered. They are not in terms of investment in discovery of the technique. A parallel approach might be used, however, in examining "discovery investment" in techniques themselves.

without causing a sacrifice in the amount produced at another time of the year. This relationship certainly exists between distant years; or perhaps even between sheep and beef produced at the same time of the year on some ranges.[4] Figure 1B includes a positive-sloping portion of the opportunity curve; indicating that over this range, producing beef at one point in time increases the amount produced at another time. Grazing systems that control brush seedlings may serve in this capacity; in allowing greater grass and beef output at a later point in time. In C, the two enterprises are competitive only; indicating that production of more beef of one time or kind (or sheep) causes a sacrifice in the amount of beef, of another time or kind.

The important economic implication of the supplementary and complementary relationships is that price relationships among points in time, or among types of livestock as the case may be, are unimportant. Each should be produced to its limits of the particular relationship. This is a focal point in design of range research. Experiments are needed to indicate more clearly the rate at which range areas can be stocked during one month or year without reducing the amount of grass and livestock in a later month or year. Experiments need to be designed for sufficiently long periods of time, not only to allow expression of these relationships but also to "average out" weather fluctuations if limits of supplementarity are to be established. Weather fluctuations also present an important area for use of economic concepts in physical research. One aspect has already been outlined in the programming discussion; namely, the development of "storage" activities allowing forage from one period in time to be held for a later period. Undoubtedly, use of the "excess" forage in years of abundant rainfall is supplementary to use of more limited growth in dry years. Hence, another alternative is to stock ranges according to grass productivity of each year, a task that is not simple unless ready supplies of animals, or highly flexible herds, can be used for varying rates of stocking among years. Physical research should be designed to provide input-output quantities for comparing the costs and returns of such alternative methods for meeting weather variability.

Production Functions and Economic Optima

The concept of a production surface can be used in designing research for specifying economic optima for such things (1) as the rate and nutrient combination for fertilizing irrigated forage, (2) as the optimum combination

[4] In a programming sense, a supplementary enterprise has a zero coefficient in the P matrix, corresponding to the resource in the B matrix for which it supplements another enterprise. A competitive range (portion with a negative slope) of the opportunity curve also exists in both A and B of Figure 1. It is unlikely that either supplementarity or complementarity could exist for all possible patterns of resource allocation. In a programming sense, complementary enterprises must be combined as a single activity with, as in the case of supplementary enterprises, a restriction in the B matrix defining the limits of the relationship.

of native grass or hay and protein supplements in wintering cattle, or (3) as the optimum proportion of cattle numbers to land in producing summer beef. Possibilities in designs of fertilizer experiments to allow specification of production surfaces, isoquants and isoclines have been explained adequately elsewhere.[5]

One problem in ranch management is to specify the optimum winter ration, usually including hay or grass and supplement. Again, however, specification of this ration requires estimation of the beef production surface. Just as the production surface can be predicted for other classes of livestock and feed, it also might be predicted for wintering of cattle or sheep.[6] A minimum requirement and complicating situation is, of course, that breeding stock must be kept in a condition to drop healthy calves or lambs. However, even within these restricting requirements for research, we believe that a production function of the general nature of (15) can be predicted; where W is weight at the end of the wintering period, G is forage fed per unit of time and S is supplement fed over the same period. With some range over which W can fluctuate, the proportions and levels of G and S can be varied to predict the production surface equation. Then by setting W at an "end of the season" weight which is consistent with healthy calving or lambing, weight isoquants can be derived which are expressed in equation form with one feed as a function of the other.

$$W = f(G, S) \tag{15}$$

$$\frac{\partial G}{\partial S} = \frac{P_s}{P_g} \tag{16}$$

By setting the derivative of the gain isoquant to equal the price ratio of the two classes of feeds as in (16), it should be possible to predict the wintering ration that will minimize costs for the season; or, to determine the range of rations that give only slightly different costs. In (16), P_s is the price of supplement delivered at the ranch while P_g is the cost per unit of producing

[5] Derivation of these quantities from a fertilizer experiment allow specification of the least-cost fertilizer mix for a given forage yield, and the optimum level of fertilization and forage yield, only if the experiment is itself designed to allow prediction of the production surface. Cf. E. O. Heady, W. G. Brown and J. T. Pesek, *Crop Response Surfaces and Economic Optima in Fertilizer Use*, Iowa Agr. Exp. Sta. Bul. 424; W. G. Brown, E. O. Heady and J. T. Pesek, *Production Functions, Isoquants and Isoclines in Fertilizer Use*, Iowa Agr. Exp. Sta. Bul. 441.

[6] As examples for other livestock and feeds, see: E. O. Heady, *et al.*, *New Procedures in Estimating Feed Substitution Rates for Swine*, Iowa Agr. Exp. Sta. Bul. 409; E. O. Heady, *et al. Production Functions and Estimation of Economic Optima in Dairy Cow Rations*, Iowa Agr. Exp. Sta. Bul. 440; E. O. Heady, *et al.*, *Production Functions, Gain Isoquants and Economic Optima in Rations for Broilers*, Iowa Agr. Exp. Sta. Bul. 441; E. O. Heady, *et al. Production Functions, Gain Isoquants and Economic Optima in Rations for Turkeys*, Iowa Agr. Exp. Sta. Bul. 443. As an indication of the economic logic in relation to physical experiments, see E. O. Heady, "Integration of Physical Sciences and Agricultural Economics," *Canadian Journal of Agricultural Economics*, Vol. 4, No. 1.

hay on the ranch; or the cost of purchased hay delivered to the ranch. From (16), we can derive an equation showing S as a function of G. Then, solving G and S, we can derive the optimum proportion of hay to supplement, or per animal per unit of time.

Summer stocking

Another major problem in ranch management is the question of the optimum rate of stocking of summer ranges. To a large extent, the main facet of this problem is weather variability; the extent to which interyear variations should take place in stocking rates. But to define adjustments that should take place among years, we need to know optimum rates of stocking in individual years of particular rainfall or grass yields. With a series of properly designed experiments over time to provide this information, the degree of supplementarity or competition among time periods also would be better known. Leaving aside interyear variations because of time and space limitations, we now focus on the relationships of economic concepts to research for specifying optimum stocking rates in particular years. Of course, this type of range research is difficult and costly because of the large land acreage and cattle numbers involved.

Conceptually, answer to optimum stocking rates can be answered by experiments that consider both land and cattle numbers as variables in the beef production function or surface. In this sense, research should be designed to provide a production function of the form of (17) where beef production during the summer, B, is dependent upon the number of cattle, C, and the acreage of land, L.

$$B = f(C, L) \tag{17}$$

Given estimates of the parameters in the production function, optimum stocking rates might be determined in three different ways; depending on the magnitude of scale coefficients. If for this function, constant returns to scale exist when both input categories are increased in constant proportions (i.e., $\epsilon_C + \epsilon_L = 1.0$) but land and cattle substitute at diminishing rates in production of a given amount of beef, the optimum ratio of cattle to land can be specified as in either (18) or (19). For (18), the magnitude of L in (17) is fixed to represent a given acreage and (18) is used to specify the number of cattle, for the fixed land acreage, which will maximize profits.

$$\frac{\partial B}{\partial C} = \frac{P_c}{P_b} \tag{18}$$

$$\frac{\partial C}{\partial L} = \frac{P_l}{P_c} \tag{19}$$

This step might be accomplished by setting the marginal product (in

terms of beef produced) of cattle numbers to equal the ratio: price of beef sold divided by price (cost) of providing cattle for range. Then solving for C, we could determine the optimum number of cattle for the fixed land area, L. Also, where constant returns to scale exist but diminishing returns hold true for either resource increased in proportion to a fixed quantity of the other, the optimum rate of stocking can be determined as in (19). In this case, the magnitude of B (beef produced) in (17) is held constant and C (cattle numbers) is expressed as a function of L (land acreage). From the latter we might compute $(\partial B/\partial L)/(\partial B/\partial C)$, or more conveniently $\partial C/\partial L$ for our purposes, and set it to equal the ratio: cost (price) of a unit of stock cattle divided by the cost (price) of a unit of land. Then solving simultaneously for C and L, we can determine the quantities of cattle and land that will minimize cost of producing a given quantity of beef. The quantities of C and L then can be expressed as C/L, to show the optimum rate of summer stocking. This rate may well vary among ranches, depending on the magnitude of P_c. If a large quantity of winter hay is available at a relatively small cost, then the ratio P_l/P_c will be larger and the substitution ratio $\partial C/\partial L$ can be larger; thereby specifying a heavier rate of summer stocking. If on the other hand, winter hay on the ranch is scarce and costly, or wintering must depend heavily on purchase of costly supplements, the price ratio in (19) will be lower. Cost of producing a given amount of summer beef, then will be minimized only if $\partial C/\partial L$ is lower accordingly. With $\partial C/\partial L$ smaller than in the previous case, then C/L, the optimum rate of stocking, also will be smaller where the cost of wintering cattle (to put on summer range) is more costly.

If constant returns to scale do not hold true for the function in (17), then the optimum rate of stocking can be determined only by the approach represented in (20) and (21). In these equations, the marginal products of land

$$\frac{\partial B}{\partial L} = \frac{P_l}{P_b} \tag{20}$$

$$\frac{\partial B}{\partial C} = \frac{P_c}{P_b} \tag{21}$$

and cattle are set to equal respectively the ratios: (1) the cost (price) of providing a unit of range divided by the price of beef produced on summer range and (2) the cost (price) of providing a unit of cattle to put on range divided by the price of beef marketed from summer range. From these two equations, the quantities of land and cattle that will maximize profits (and minimize costs for the amount of beef produced) can be solved simultaneously.

If constant returns to scale (for any given ratio of cattle numbers to land area) do not exist, then optimum stocking rates can be determined only

from experiments paralleling the general design in Figure 2A. In A, each diagonal line represents the specified ratio of cattle to land: the line labeled 1C:30L indicates one animal unit per 30 acres. Under decreasing returns to scale, for cattle and land resources increased in constant proportions, treatments in the experiment need to include both (1) different ratios of cattle to land (i.e., points on different diagonal lines, as in Figure 2A, representing the relevant ratios) and (2) different levels of the same ratio

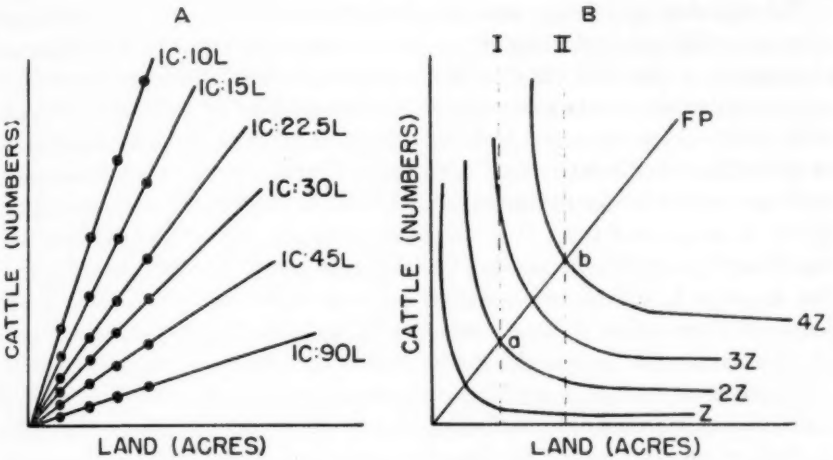

FIG. 2. ALTERNATIVES IN DESIGN

(i.e., different points on each of the given lines). Hence, the dots might represent the different treatments necessary.[7]

Generally, however, it can be expected, over reasonable ranges of resource inputs, that constant returns to scale should hold true for the two resources, cattle numbers and land, increased in fixed proportions.[8] In other words, if 20 acres and 1 animal result in 350 pounds of beef, then 40 acres and 2 animals should result in 700 pounds of beef. Here diminishing returns may hold true as cattle numbers are increased relative to a given land

[7] The pattern of treatments indicated by dots merely suggest that the experiment should include both (1) different ratios and (2) different levels of a given ratio. Another alternative is: draw parallel lines, with a 45 degree slope from the cattle axis to the land axis. The points where these lines intersect the diagonal ratio lines might then serve to denote treatments. It is possible that ratio lines might best represent arithmetic progressions of cattle to land (as 1C:10L, 1C:20L, 1C:30L, 1C:40L, etc.). This would certainly be true for the alternatives outlined in respect to Figure 2B. Too, the design for this purpose might parallel that outlined by Box and Wilson, "On the Experimental Attainment of Optima Conditions," *Jour. Roy. Stat. Soc.*, Series B. 13:1–45.

[8] In this use of the term scale, reference is to the sum of elasticities for land and cattle. If $\epsilon_L + \epsilon_C = 1.0$, reference is to constant returns to scale for the two resources. Although this use of the term scale departs from the conventional notion of all resources being variable, it is convenient for current purposes.

acreage. But constant returns will hold true as cattle and land are increased in fixed proportions. The surface or production function then has the characteristics represented in Figure 2B. In this case, the segments of the line FP (or any other fixed proportion line), between points of intersection by the product contours, are of equal length. However, for lines I and II, representing varying proportions of cattle numbers to land area, the segments between points of intersection increase; denoting a declining marginal product for cattle.

The experimental design now can be quite simple. It need only allow application of the principle denoted in (18) or (19); rather than in simultaneous attainment of (20) and (21), as in the previous case. The experiment need only include treatments along a vertical line such as II in Figure 2B (or a vertical line along any series of dots in Figure 2A). With diminishing returns to cattle increased relative to a fixed area of land, but constant returns for land and cattle in fixed proportions, the entire production surface can, in effect, be estimated from this simple experiment. With the land area for line II in Figure 2B, representing twice that of line I, we know beef production at point b will be twice that of point a. The same will hold true for points of intersection of lines I and II with any other fixed proportion line. Thus, if we predict the simple, single-variable production function $B=f(C)$, with land area fixed at a specified magnitude, we can, for all practical purposes, specify the entire production function; given the knowledge that constant returns to scale hold true for cattle and land resources. The two-variable function can be derived from the single-variable function by application of the knowledge in (22).

$$\frac{\partial B}{\partial C}\cdot\frac{C}{B}+\frac{\partial B}{\partial L}\cdot\frac{L}{B}=1.0 \tag{22}$$

In the case of the single-variable function $B=C^{.6}$, we would know that the two-variable function, based on the simple experiment and employing the knowledge of (22), would be $B=C^{.6}L^{.4}$. Similar coefficients could be derived for other algebraic forms of equations. (It is extremely likely that other algebraic forms are more appropriate than the simple example shown). After this function has been derived, then product isoquants can be computed, to indicate marginal rates of substitution between cattle numbers and land acres. Application of (19) then would allow specification of the optimum ratio of cattle to land, for the rancher with limited resources which might be invested in either cattle or land (grazing rights), both of which are variable. More directly, from the simple experiment, (18) would allow specification of the optimum ratio of cattle to land; for the rancher who is institutionally restricted to a given acreage, but has capital to add variable cattle numbers to it.

USE OF SURVEYS IN ECONOMIC RESEARCH IN FORAGE PRODUCTION FOR GRAZING

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THE evaluation of forage production involves the normal problems of dependence upon measurement of physical inputs and outputs. Economic evaluation adds the complication of assigning economic values to physical inputs and outputs, including the allocation of joint costs and returns. Then when one conducts research on forage produced for harvesting by grazing livestock, he is faced with some additional problems in methodology. Here the researcher deals not only with the human element involved with measurements, judgments, and values, but also with the not-yet-predictable animal element of grazing choices, and differences in the metabolism of livestock. Thus even the title limitation of the "use of surveys" in such research leaves a broad field open for discussion.

This presentation will be confined to the methodological problems found in the use of surveys in economic research in forage grazed on Western rangelands. A series of papers by Olson, Fellows and Hardin[1] at the 1955 AFEA meeting discussed a similar group of problems confronting economists doing pasture research. These papers, plus the geographical location of the 1956 meeting and the current research of the author, seem justification for limiting the discussion to the semi-arid and arid Western range. Beef cattle and sheep are the domestic livestock that harvest most of this forage while deer and elk are the principal big game involved. Goats, antelope, rabbits, and other rodents consume important quantities of the forage in some areas. Of course it must be recognized that the basic methodological problems and procedures are the same wherever the economic evaluation of grazed forage is conducted. Irrigated pastures grazed by dairy cattle, natural or improved pastures of the humid regions, or Western range where it may require 30 to 50 acres to provide a month of grazing for a beef cow and her calf all have some basic similarities in economic research. Nevertheless, it is those problems unique to Western range forage evaluation that will receive major emphasis in this paper.

Physical Surveys

The starting point for empirical economic research is the information

[1] Russell O. Olson, "Problems of Research in the Economics of Forage Production and Utilization Research," Irving F. Fellows, "Economic Application of Forage Production and Utilization Research," Lowell S. Hardin and Glenn L. Johnson, "Economics of Forage Evaluation," *Journal of Farm Economics*, Vol. 37, No. 5, December 1955 pp. 1440-1459.

provided by physical surveys. These describe the resources in physical units, record the physical inputs, measure the volume of output, and give us the physical input-output relationships. The economist must be provided this information or, second best, obtain it himself. Then he is in a position to assign monetary values, analyze, and make economic interpretations.

Soil surveys have long been a basic tool in stratifying areas, identifying resources, and generalizing results. Unfortunately, very few soil surveys have been published for the Western rangelands. A few areas have been covered by reconnaissance surveys but even this level of detail and accuracy is available for an extremely small portion of the millions of acres of range. Those of us conducting research in range economics have learned to turn to range surveys in lieu of soil maps and descriptions.

Range vegetation surveys[2] locate and describe the vegetation and physical characteristics of the site in a manner quite similar to the map and legend of a soil survey. Forest cover maps perform the same general service in timbered areas. Range and forest cover surveys are useful in sampling, identifying sites, and generalizing. More difficulty is experienced in using these sources of physical information for inputs and outputs. If the survey is of recent origin, it may be quite useful in determining forage production under specified conditions. It is regrettable that range surveys made in recent years are available for such limited areas.

Game surveys, giving limited information on numbers, location, feed supplies, and movement of big game, may be very helpful in some forage evaluations. Usually these surveys are for natural areas such as a watershed or the region inhabited by certain game species. Here again it is difficult to obtain input-output relationships although some studies have estimated the amount of game harvested in an area. Game biologists experience great difficulty in attempting to obtain reliable data on their surveys; perhaps this tends to make them more sympathetic with economic surveys.

One of the best tools to use in stratifying a study universe is an ecological classification of the vegetation. The natural vegetation reflects the total environment, including the use of the area, and is a logical physical basis upon which to stratify an area. In this manner areas of similar potential physical output can be grouped. Unfortunately, these ecological studies cover relatively small portions of the Western range.

Economists should bear in mind the fact that physical surveys are subjected to certain value judgments, usually tempered informally by socio-economic conditions. Consequently data that are published as quantita-

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[2] Dorothy Brown, "Methods of Surveying and Measuring Vegetation," Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England, 1954.

tive may be of little more value for economic research than properly identified qualitative information. Soil, range, and game surveys each must face the problem of sampling the universe, identifying or evaluating the resource, and generalizing from the sample. Both the amount of detail and the level of accuracy are important to the conduct and use of these surveys.

Research being conducted over broad areas is handicapped in the use of some physical surveys in the lack of uniformity and standardization, both in the mapping units and the mapping procedure. Costello[3] points out this weakness, which is quite apparent in range surveys. A further complication results when surveys made at different periods must be used. Biotic and physical environment is dynamic; so also are survey methods. Economists faced with the task of assigning monetary values to physical units meet an unanswered challenge with range and game surveys. How much is an animal unit month (AUM) of grazing worth? Before the economist starts raising all his questions as to where and when the forage is available and to what animals, he is confronted with a discouraging fact: An AUM, although probably the most commonly used measure of range production, is not a standardized unit. Furthermore, many other units used in range production work are neither universally accepted and standardized nor readily amenable to economic analyses. For instance, pounds of forage produced per acre is not always measured the same way, such yields are available in few areas, and the forage has a different worth when used by various classes of livestock and at different seasons. Phase 3 of the western regional research project W-16, "Economics of Rangeland Improvement," was established to work out more suitable measurements of range productivity. Work on this phase of the project proceeds slowly over its many hurdles.

Increasing population pressures have forced a closer study of multiple use of Western resources. The common alternatives that must be considered in evaluating range forage are domestic livestock, big game, recreation, water production, and timber. Closely allied to the multiple-use concept and methodology are the problems faced by economists in using physical surveys to determine forage values as to season of use, grazing intensity, and class of livestock (cow-calf, yearlings, twos).

Such problems are the concern of the physical and biological scientists as well as the economist. They are being attacked by task forces of these groups. As a result physical surveys of today are more useful for economic analysis than those of yesteryear and the promise is bright for even better basic information for tomorrow.

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[3] David F. Costello, "Factors to Consider in the Evaluation of Vegetation Condition," *Jour. Range Mngt.*, Vol. 9, No. 2, March 1956.

Economic Surveys

Most research reaches a stage where empirical data are required. Some studies use empirical results to describe a situation or to identify and isolate a problem, whether or not the data are used to analyze the problem and test an hypothesis. Suffice here to acknowledge the importance of recorded experiences.

There are several methods and means by which data are obtained. The controlled experiment, so common in physical and biological sciences, is rare in social studies where variables are not normally controlled for observation. Hence surveys, wherein the variables are studied without being under control, are more common. Economists usually rely on experiments as a source of physical data; only occasionally can they use experimental results for monetary input-output relationships. Grazing experiments offer considerable data on physical inputs and outputs, yet are located so that important vegetative types in numerous physical environments are not well represented. Furthermore, these experiments normally do not provide realistic cost-price data nor do they reflect the economic relationships found on most ranches. Hence, although controlled experiments offer an important segment of empirical data, they leave a vital gap in the source of data for economic evaluation of range forage. Researchers working with the ranch firm may notice this missing linkage more than those studying the range livestock industry.

The case method is a means by which detailed information, potentially more accurate for the individual observation than short-schedule survey data, is obtained from a limited number of observations. It is an intensive study of a few units whereas most surveys are of a more extensive nature, both in depth and breadth of coverage. This intensive study permits the researcher a close look at the subject as an organic entity whereby causal relationships may be identified and analyzed. A major weakness of the case method is that of representing a universe. Unless the few cases are well selected, they may present a misleading picture of the universe to which they belong; dangerous generalizations may result. There are not the objective checks that can be used to test the data as may be done in statistical studies. Still the method offers good opportunities to study the ranch as an operating firm. If range forage is to be evaluated as it contributes to the ranch firm, case studies are the most efficient means of obtaining empirical data.

Statistical studies are recently developed research tools by which mass data may be collected, compiled, and analyzed to yield useful information. As with any new member of a family, a period of trial and error is required to place the new technique in its proper perspective so as to make the best use of its special talents. Ostle states that statistics, as a

science, deals with the following: "(1) collecting and summarizing data, (2) designing experiments and surveys, (3) measuring the magnitude of variation in both experimental and survey data, (4) estimating population parameters and providing various measures of the accuracy and precision of these estimates, (5) testing hypotheses about our population, (6) studying relationships among two or more variables."[4] Our immediate concern with surveys deals with each of the six uses outlined by Ostle. Surveys are such a common method of obtaining mass data in agricultural economics that statistics plays a major role in our research. It is essential that surveys and statistical techniques be used for those purposes for which they are suitable. A false sense of confidence in the data or erroneous conclusions and generalizations can result when surveys and statistical analyses are improperly used. No amount of statistical maneuvering can add accuracy to data that were unreliable when obtained. Mere bulk of many observations cannot shore up the weakness of poor sampling or unsatisfactory interviews on a survey.

Ranch Surveys

Deming says, "Statistical research itself is directed toward increasing the speed, reliability, and usefulness of whatever statistical information is deemed necessary; decreasing the cost of getting it; providing better measures of its reliability and more accurate interpretations."[5] In line with this reasoning, ranch surveys, as a form of statistical research, offers us an effective method of obtaining reliable information about ranches. And, of course, most of these surveys would be a sample rather than a complete census. Both probability and judgment samples are used for this purpose.

Sampling problems

Probability sampling is to be preferred wherever enough information is available to design the sample and it is feasible to carry out the field work. Some ranching areas still have so little data, generally available to research workers, about the individual ranches that designing and drawing a probability sample for analytical purposes is difficult if not impossible. Census data for each ranch are usually not available. Furthermore, the difficulty of obtaining the interviews required by the sample may impose an impossible restriction. Call-backs on those not at home, difficulty of obtaining interviews on first call, long distances, few telephones, and poor roads offer real barriers to probability sampling under which

[4] Bernard Ostle, *Statistics in Research*, Iowa State College Press, Ames. 1954. p. 3.
[5] Edwards Deming, *Some Theory of Sampling*, John Wiley and Sons, New York, 1950. p. 4.

the rules are quite rigid concerning the completion of the selected observations. Nevertheless, probability sampling offers significant advantages in ranch surveys, especially to those who lack the knowledge and experience to carry out successfully a judgment sample. Deming points out these advantages in probability sampling "for which the sampling errors can be calculated, for which the biases of selection, nonresponse, and estimation are virtually eliminated or contained within known limits." But with judgment samples "the biases and sampling errors can not be calculated from the sample but instead must be settled by judgment."[6] The advantages one first sees in a judgment sample, insofar as planning the sample and completing the field work is concerned, may be completely negated by the sacrifice of statistical analyses of the data. This may impair the analyses and weaken the generalization of conclusions. Actually the biases, not the sampling errors, in a judgment sample may be the key to the degree to which the sample represents the population being studied. Upon these biases hang the validity of the survey even though the sampling errors may be small.

Western ranching areas present some serious problems to the economic surveyor. The research worker who tries to plan his sample carefully, by making estimates and calculations of probable sampling errors based on presurvey data, is faced with a dearth of information in most ranching areas. Very few economic studies have been made. This forces the sample designer to sources having less complete coverage, both of the ranches and of information about each. Some of these sources are ASC, BLM, FS, and SCS files; county extension offices; credit agencies; or other businesses or agencies serving the ranches in the area. We were able to draw a stratified random sample from these latter sources in Southeastern Oregon.

Another situation will, sooner or later, cause the uninitiated some concern. This is the complex relationships among the many factors involved in the production of a single product. At first glance one should suppose the study of a single enterprise firm to be quite simple. Such is not the case on cattle and sheep ranches. The influence of different intensities of grazing or the effect of a drought are examples of common complications. These variables have influences that are effective over many years, both on the natural responses of forage and livestock, and on the decisions by the operator to change the size of his herd or feed light or buy supplemental feed. And as with other types of farming, ranchers seldom turn to just one practice to induce some change. The effect of weather is more difficult to measure but at the same time more important to evaluate on ranches than on farms. Ranchers are largely dependent upon natural

[6] *Op. cit.*, p. 10.

vegetation, which has a long-run and complex response to weather fluctuations. The time factor carries some implications on the range that has no direct counterpart on fields.

It is the combination of limited information about ranches and the generally unstudied interrelationships among the factors of production that cause the sample designer his greatest concern. In those ranching areas where more studies, physical and economic, have been made, the problem is not serious. Nonresponse and poor quality of data may be by-products of limited previous studies. Ranchers are an independent group of individuals who have been subjected to fewer regulations and less "prying into their affairs" than most farmers. They frequently are reluctant or at least hesitant to cooperate with a survey. Experience leads me to conclude that they keep fewer records than farmers. Many ranchers keep only the minimum records essential to permit an accountant to make out an income tax return for them.

Check stubs, a brand count of livestock, and the receipts for cattle sales are helpful for some purposes. They certainly leave much to be desired in allocating costs, in determining the source of feed throughout the year, in measuring capital investment, and in evaluating the contribution of each factor of production to the salable product. Further, only a few ranchers have begun to think ranch management. They have not progressed beyond the stages of physical production in their evolution from stockmen to grassmen to ranch managers, a classification that adds ranch business management to the realm of animal and forage production. The economic surveyor must weigh these obstacles as he plans his research. We in Oregon have recently run into sampling problems in obtaining sufficient information about the drought-alleviating practices used by ranchers to permit us to stratify satisfactorily. This situation appears to be common in range economic research.

Use of surveys

Surveys are a suitable method of obtaining empirical data for economic evaluation of range forage if three basic requirements are met:

(1) The interviewer, and the survey, does not influence the answers.
(2) The questionnaire seeks information only on matters that most ranchers are capable of answering accurately.
(3) Proper techniques are used in the analysis of the data so as to lead to correct generalization of results.

It is possible for an interviewer to talk a figure out of most ranchers, and thus fill in another blank on his schedule, even though the rancher may not know the answer. Such replies can then become the basis for a statistic about the ranches being studied. If the interviewer has a good

practical knowledge of the ranches under study, his "talked" or "suggested" replies may prove to be statistically highly significant. The data have thus assumed a reliability and respectability unwarranted by the ranchers' knowledge. This weakness is inherent in surveys but not unique to them. However, it is easier to check or cross check for errors in case studies and controlled experiments. Statistical methods recently developed help to spot or warn of such errors in surveys.

The danger of incorrect conclusions and improper generalizations can be minimized by following the statistical rules of sampling, careful editing of the schedules, and making the appropriate checks on the survey data. Statisticians working with social scientists are making encouraging strides in the development of useful tools for analyzing mass data.

General economic surveys of ranches may be used to provide valuable information not available elsewhere on grazing and feeding patterns, season of use, number and kind of livestock using a range, selling weights, management practices, and other descriptive material. Information available through properly conducted surveys provide much of the data necessary for budgeting or programming alternative uses for range forage and the other inputs of range livestock production. Stratification in sampling assures the economic researcher of representing a wide variety of conditions found in ranching areas. The logical place to start economic research on range forage in most states is with a survey designed to provide both descriptive information and the data necessary for analysis of the specified problem. Some ranching areas have this basic material available from previous work.

The analysis of range forage cannot proceed far until the relations of the various feed sources to the salable product must be known. The causal relationships of winter feeding, breeding program, range management practices, and marketing policies must be known to enable an evaluation of varying the inputs of one or several of these variables on the output. Here the survey falls short. It is difficult, if not impossible, to obtain these relationships with a satisfactory degree of accuracy by short-schedule survey. Many ranchers do not keep records of acceptable accuracy and detail to provide the data for this purpose. This is the place for case studies; whether one calls them a detailed survey or the case method is not the point. Two-phase sampling on a survey would describe the procedure. The first phase of the survey, with more observations, would set the stage for the more detailed analysis made possible by the case studies of the second phase. These cases would be selected, deliberately and purposively, from among those ranchers who could provide the data required. The cases studied would provide the input-output data and show the causal relationships on operating units not under the researcher's control. There is still need for the data supplied by controlled experiments

but these are usually concerned with only the physical input-output relations that are so important as the foundation upon which to construct economic models and build economic research.

Our experience in the western regional research project "Economics of Rangeland Improvement" indicates that the value of range forage to a rancher must consider the role played by the seasonal forage being studied in relation to the ranch as an operating unit. Increased summer forage is of value mainly as it helps to increase the quantity or quality of livestock products sold, or decreases the cost. If that increased seasonal forage merely creates more pressure on the limiting factor of production, which may be winter feed, then it has a low value on that ranch. In the long run, assuming adjustments can be made to use the increased forage efficiently, the additional summer grazing has greater value. These relationships are best studied by the case method of research after a more general survey has pointed up the problem, described the general situation, and supplied basic information on ranch organization and operation. This is the opportunity for two-phase surveys in which the second phase is actually case studies.

Cautions and Conclusions

Western ranching has a degree of uniqueness that must be understood by the economic researcher before he can perform his duties. Economists without experience in the West can easily underestimate the importance of these unique characteristics. This can lead to false starts, blind alleys, and unrealistic conclusions, as well as to poor public relations. Several books and reports are now available to aid in a Western ranch orientation. Granted, it is a bit difficult to feel at ease on a horse merely by reading good books on horsemanship.

Land tenure is of major concern in the economic evaluation of Western range forage. Not only is a high proportion of the rangeland administered by several federal agencies but, more important in forage evaluation studies, on most ranches in some areas nearly all of the forage available during certain seasons is controlled by these agencies. In other ranching areas, a large part of the land is owned by nonagricultural companies such as land grant railroads. The land ownership pattern is vital in the operation of Western ranches. The familiar checkerboard pattern is slowly being blocked up but remains a problem. Homestead tracts traditionally include the water sources, thus introducing an important qualitative factor in land tenure. The Western pattern of ownership of the land and control of the grazing inject more inflexibility into ranch operations and alter the cost picture. Grazing fees and real property taxes on Western ranches create special problems. Land tenure in some areas dictates changes in the usual analytical procedures especially in budgeting and

programming, in which considerable flexibility of resources is assumed.

Ranch management men observe a wide diversity in the organization and operation of Western ranches. True, the physical processes and procedures fall into discernible patterns; less so the economic. As ranching continues to become more commercialized and competitive, the organization of ranch resources and the operation of ranch units will fall into more narrowly defined patterns. To date this genesis has only begun, hence one observes more similarity among ranchers than among ranches.

The few records kept by ranchers is a greater barrier to economic research than in most farming areas. The evaluation of pasture forage is difficult for lack of pasture-use records; it is doubly so with range forage because ranchers have less accurate knowledge of grazing use and output. Weights, and even animal unit days of grazing, are generally not known by ranchers. Surveys, especially single-interview short-schedule surveys, are not satisfactory in obtaining enough data on range forage input-output relations. Therefore, a "quickie" survey is no substitute for case studies and controlled experiments as a source of input-output data.

Some Western ranching areas have no detailed information available on ranch operations. The short-schedule survey offers an efficient method to obtain basic data essential to economic research. These surveys may well be stratified to suit the needs of the problem and the sample population should be randomized to permit more complete statistical analysis and reliable generalization of results. An economic evaluation of range forage requires input-output data not usually obtained from general surveys. Case studies or detailed long-schedule surveys are recommended to serve these needs. Informed, disciplined judgment is even more critical for this step than in the general survey. Then combine the data obtained from this two-phase sample survey with physical input-output data from controlled experiments of the physical scientists. Adequate data for the budgeting or programming analysis should thus be available to complete the economic research of range forage production for grazing.

DISCUSSION: USE OF ECONOMICS IN MAKING DECISIONS RELATING TO RANGE USE

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Dr. Hopkin's discussion of the substitutability between deer and cattle provides a point of departure for some remarks that—in keeping with the theme of this session—might be entitled "Use of Economics in Devising Administrative and Institutional Procedures for the Public Range Lands."

I have a question about a technicality in Dr. Hopkin's discussion of deer-cattle decisions; but this is a minor matter, both in evaluating his paper and in the following remarks. Most of the ideas in his paper evoke ready agreement. The technicality pertains to whether or not "expenditures that people make in pursuit of wildlife as compared with expenditures for other goods and services represent our soundest basis for comparing the contribution to society's happiness and welfare." There is in this statement the hint of a fallacy that has appeared often in the computation of benefits from resource expenditures. The fallacy would be to attribute the entire value of the product to one productive factor. We should not attribute the *entire* value of hunting to the range lands. Rather, the value of the range lands for hunting is the entire value of hunting *minus* other expenditures in hunting. Hopkin's later allusion to charges for hunting licenses hints at the procedure to avoid this fallacy. The procedure is to subtract the other expenditures in hunting, in which case we are left simply with the payment for hunting license. In other words (still following Hopkin's proviso as to the absence of rationing) the contribution of the range lands to society's happiness and welfare when used for hunting can be measured in terms of the value of hunting licenses, so that the need for estimating the other expenditures by hunters does not arise.

The procedure just advocated makes private and public decisions more alike. (In his earlier analysis of such operations, Hopkin quite naturally adjusts cattle and sheep revenues by subtracting expenses.) Let us now consider some possibly important differences between public and private decisions that arise from the fact that an administrator's decisions are more likely to affect the price that can be obtained from range outputs. He often faces less than perfectly elastic demand for having cattle and deer on the public lands in his jurisdiction.

In achieving efficient utilization of range lands, the administrator can be guided by the two kinds of signals (1) rationing, which suggests raising the price of the range output that is rationed (or, possibly, excess supply, which suggests that the price be lowered), and (2) divergence among the price ratios of range outputs and the substitution possibilities in supplying outputs. The absence of these two conditions provides a criterion of efficient range utilization. The technical information required to implement the policy implied by the criterion consists of the substitution possibilities, and Hopkin's emphasis on these is laudible. One may add that when the administrator faces sloping demand curves for range outputs, the criterion conflicts with profit maximation. The following of this criterion assures action in the public interest rather than action that would be taken by a private monopolist.

Armed only with knowledge of the substitution ratios at which he is operating, the administrator may then attempt to find the point of most

efficient utilization by trial and error. That is, he can proceed in steps according to the above signals until the criterion is fulfilled. However, he may wish—rightly—not to make the frequent changes in utilization and prices implied by the trial and error method.

Let us take an example. Suppose on a given area of public land (a) that there are relatively few deer and relatively many cattle (in Figure 2 of Hopkin's paper, a little more than OH deer and a little less than OG cattle); (b) that the administering agency has adjusted grazing fees and charges for hunting licenses to eliminate rationing or excess supply; and (c) that the ratio of the fee for grazing an animal unit for a year to the fee associated with shooting a deer is lower than the rate at which deer can be substituted for cattle on the range.[1] Because of condition (c), the administrator wishes to increase the number of deer by decreasing the amount of grazing; but with diminishing substitution in production such as depicted in Figure 2 and with sloping demand curves for deer and cattle, he may have difficulty in estimating beforehand the precise extent of the change. He would need to know not only the rate of dimunition of substitution in production but also the price elasticities of demand in order to eliminate the need for trial and error. This suggests that for the public lands, attention to conditions of demand as well as to production possibilities would be helpful in achieving efficient utilization.

In the foregoing considerations we begin to provide an ideal, or set of norms, of administrative and institutional procedure for the public lands. Let us continue, turning now to matters of pricing and other user arrangements. Lotteries and provisions of nontransferability and most other similar complications regarding hunting licenses would be nonexistent. Hunting licenses would be certificates entitling the bearer to shoot one deer. There would be no limit to the number of such certificates that one person might buy, and individuals would be unencumbered in their right to exchange the certificates among themselves. For any given amount of game hunted, the total recreational enjoyment provided by the public lands ought then to be substantially increased because of this increased efficiency in getting licenses into the hands of those who would enjoy them most.

A grazing right might most desirably entitle the holder to graze a given number of animal units on the land as long as the right was in his possession. Like hunting licenses, grazing rights would be sold at market value by the agency and would be freely saleable among ranchers or others who might wish to hold them. In undertaking a change in range utiliza-

[1] We shall continue to abstract from any costs of the agency in maintaining the deer herd and from the temporary increase or decrease in hunting that would be necessary to change from one equilibrium size of herd to another.

tion, as in the example above, the agency would simply purchase some of the outstanding rights. (On range lands with a large number of users, the price paid would be whatever was necessary to purchase the rights from private owners. However, especially for lands where the demand for the grazing rights was limited to one or a few users, the agency would need legal power of condemnation. At the same time ranchers would have legal recourse if they wished to protest the amount of remuneration or, when buying, the price set by the agency on rights.)

Consider, finally, the handling of the hunting and grazing revenues. As contrasted with present practice, a substantial profit would be realized from the operation of much public range land if the range outputs were supplied at market prices as suggested in the preceding paragraphs. The agency would make sure that all of its costs of administering the lands were defrayed out of its revenues. In addition, a separate fund would be set up and maintained from revenues, which would be used to make and maintain range investments such as fencing, water holes, and access trails and roads. (The administering agency would also guarantee compensation to ranchers for any investments they might be deprived of in condemnation proceedings.)

Once administrative and investment costs were defrayed, the agency would likely still find itself making a profit. This profit would represent the site value, or pure rent, of the lands. The profit would not be freely available to revert to the U. S. Treasury, however. It would be used to reimburse the capital losses incurred in transferring from present practices to the ideal we have been describing by ranchers who use the public lands. These losses would occur because grazing rights, being now most commonly priced at less than market value, at present result in enhanced value of the private land with whose use they are associated. Bonds might be floated to the extent necessary to compensate for the decline in private land values. These bonds would then be paid off with the agency's profit. After the many years required to pay off the bonds, revenues over and above administrative and investment costs would become available for retention by the U. S. Treasury. The floating of bonds represents only one way in which the compensation could be accomplished. Corporate or cooperative shares might instead be issued and the lands operated under the legal arrangement corresponding to these kinds of shares. If the lands were operated under a corporate or cooperative arrangement, profit would presumably go in perpetuity to the shareholders and would never become available for retention by the Treasury.

Are these ideal arrangements which we have tried to sketch so different from present arrangements that they can be of no help in public land management barring drastic institutional upheaval? No, I believe they

should prove helpful as long as there is any latitude in action whatsoever. The arrangements provide an ideal of efficient use which can be kept in mind and approximated as closely as possible.

For instance, suppose that the unalterable conditions facing an administrator include fixed, low charges both for grazing and for hunting. Even though ideal pricing arrangements are precluded, he may still have choice as to amount of each range output. The excess demand for each range output in conjunction with an estimate of its elasticity of demand enables an estimate of what the price ratio without rationing would be at given outputs. (To estimate the free market price of a rationed output, raise the price under rationing by the following amount: excess demand as a per cent of output divided by the elasticity of demand.) It is then possible to follow the criterion presented earlier.

In this last example as well as in an earlier one, we find that efficient range land utilization calls for knowledge of demand conditions for range outputs, most particularly their price elasticities of demand. This suggests an area of research neglected heretofore that might importantly contribute to the shaping of public land use.

DISCUSSION: ECONOMIC CONCEPTS IN DIRECTING AND DESIGNING RESEARCH FOR PROGRAMMING USE OF RANGE RESOURCES

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The paper is divided into two parts: (1) use of economics in selecting areas for research and (2) use of economics in designing research in such areas. In the first, the notations and assumptions of linear programming are used to reflect economic logic in classifying and selecting among production problems of the ranch firm. We proceed in the second by more pedestrian means.

There are three matrices through which to express relationships relevant to ranch profits: (1) a matrix of activities (X), (2) a matrix of input-output coefficients (P), and (3) a matrix of restrictions (B). The elements in X are levels of output in beef cattle and/or sheep, each in four categories: age, grade, breed and time of sale. The elements in P represent production techniques used in the activities. The elements of B are grouped in three classes of limiting factors: (1) institutional, (2) capital and labor, and (3) physical conditions. The goal is to find the particular arrangement in X which, under conditions given in P and B, and when the x_i are multiplied by "net prices," will give the greatest profit.

Many are disturbed by the assumptions ordinarily used in linear programming. Some are pacified when the technique is used for processing data to find an optimum "activity" combination. Other limitations in data are so great and the mechanical efficiencies of programming so important, that one is reluctant to quibble over some of the niceties that are glossed over with assumptions. Here, however, we are confronted with the use of programming to select problems for research. The results are not surprising:

1. ". . . the amount of profit possible for the ranch firm is limited by restrictions in B. Any 'lifting' of the magnitudes in this matrix can increase the profits available to the firm. Hence, one important area of physical research has been designated."
2. Research should be directed to the "lifting" of the restrictions that are most limiting. Surveys are suggested for determining whether profits are limited more by institutional, economic or physical restrictions.

But these results rest on the following assumptions: (1) that the marginal cost of output in each activity is a constant with respect to quantity of output (this makes it possible to use "a vector" of net prices); (2) that the production techniques do not change as resource limitations are "lifted." The latter can be handled in the linear programming technique, though some of the mechanical advantage of the technique is reduced and, more important here, it is not clear that problem selection is most efficiently handled in this manner. The first assumption is most difficult to remove in linear programming. Yet an economist must really have tongue in cheek when assuming that marginal cost is a constant in many instances for the ranch firm.

Dr. Heady follows with some sensible suggestions for ordering priorities on physical research: focus on areas where the restraining effect of limitations are greatest with research for alternative ways of "lifting" the restrictions. The alternate ways are grouped in two classes: (1) those that increase the amount of resource(s) that cause the restrictions, and (2) those that shift resource(s) from activities that do not use all that are available to activities that are deficit in the resource(s).

In the design of physical experiments, Heady suggests that considerable emphasis be given to obtaining estimates of marginal rates at which the various products (of activities or enterprises) will substitute. Such estimates are needed to implement the model wherein returns are maximized by equating such a marginal rate of substitution with (inversely) the price ratios of "products."

We might well pause here briefly to consider the limited applicability of such findings as these. The model itself gives a maximum not of returns above all expenses or even above all variable expenses. It will maxi-

mize the returns above the cost of all resources that are committed already to production and, at the same time, allocable among enterprises (or activities). For this solution to be equivalent to one that maximizes net returns, one of the following assumptions must hold: (1) the marginal cost of output from using resources specific to the enterprises (or activities) in question are essentially zero, or (2) the same for each enterprise (or activity). For example, comparing two enterprises (or activities) that are the same save only for time of product sale, the marginal cost of resources specific to the added time must be essentially zero. Comparing cattle and sheep with about the same timing of sales, the resources specific to each are assumed to add together to about the same marginal cost of output.

These limiting assumptions are, I believe, relevant to the design of physical experiments. We need estimates of production response (in the alternate enterprises or activities) from resources both (1) common to the alternatives and (2) specific to each alternative. They enter differently into an analytic model that maximizes returns above all economically relevant costs.

We turn now to experiments designed for estimates of resource combinations that minimize variable costs. Here we are on firmer ground—and ground carefully explored by the folks from Iowa State. The wintering problem is an important one. Estimates are needed of alternative combinations of forages and supplements (and within each class of feed also) that will maintain cow weights and produce a given calf crop. Some of the relationships—probably among forages and among supplements—are commonly supposed to be linear. They may well be so. Yet these things should be checked by well-designed experiments. A side benefit from the suggested research might be some idea of residual variation in calf crop (percent and weight) after accounting for winter feed rations. I would suppose that it might be pretty large.

The final example deals with stocking rates. This is a problem complicated not only by interyear weather variation and large (heterogeneous) land areas but also the problem of seasonal range in several areas of the West. A common hypothesis is that ranchers do, in some manner, consider their range as a fixed factor and cattle as *the* variable resource, some measure of beef and/or calf production being the dependent variable. In this way the problem is conceptually simpler than is the case where both land and cattle are made variables.

Which is the economically more useful basis for experimental design? One might, out of hand, say the latter. Certainly it goes farther in its optimum. On the other hand, considering the interyear variation in weather and the heterogeneity of range within a single "management

unit," one would want to be cautious in allocating research resources into the more complex design without carefully considering the requirements for getting reliable results.

Let me call attention to a most interesting small section, inserted in the middle of this paper, on "Research Planning." Anyone with experience in research relating to several allied fields will recognize the appeal of any suggestion that promises some potential in developing systematic procedures for selecting research areas and fixing some kind of priorities on them. The suggestion here appears most interesting in this respect. I do not know, quite, why the term "quantified hypothesis" is used. The concept is actually a hypothesis—in a fundamental sense, a statement that is testable and, if confirmed, would solve a particular problem. Maybe this is a useful place to use the programming technique.

Finally, let me urge some caution on pressing the use of economic criteria for the design of physical and biological experiments in agriculture. Wherever the purpose of the research is to serve some "practical" function, the use of economics is, of course, essential. However, we should not be a party to the tendency, already so evident, to shift resources away from fundamental research and into applied areas. After all, many of our alternatives are made available by research of non-economic character. Let me add hastily, on the other hand, that there are relatively few experiments in most agricultural experiment stations that would not, at some stage, benefit from the use of economic criteria in their design.

DISCUSSION: USE OF SURVEYS IN ECONOMIC RESEARCH IN FORAGE PRODUCTION FOR GRAZING

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Dr. Plath's paper on the "Use of Surveys in Economic Research in Forage Production for Grazing" has pointed up two important aspects connected with the use of surveys in range research. The first of these is that surveys, either physical or economic in nature, help to classify range lands and patterns of range organization. They also orient the research worker in the field and help him isolate existing problems in the present pattern of forage and grazing management. The second is that survey data of whatever nature they may be and especially ranch surveys, are often unreliable because ranchers do not keep adequate records of their operations. Both of these points are important and well taken.

From the approach Plath uses in his treatment of the subject I take it

that he and I agree that problems of range and forage management are essentially problems in production economics. As such they should be treated under the general conceptual framework of productivity analysis. Any methodology used in production economics should be subjected to what is in my mind the most important question one can ask about methodology in this field, namely, how well does it contribute to the elucidation of the whole or the segments of the relevant production function. Nowhere in his paper has Plath asked this question either implicitly or explicitly with respect to the survey method.

If the survey method is subjected to this particular test the following conclusions seem to me to become apparent. First, there is a good chance that survey data even if taken from a purposive and not a random sample might describe only a very narrow section of the relevant production surface. They can never describe anything beyond what is actually practiced on the farms or ranches included in the sample. In fertilizer research for example where we have progressed at least conceptually much farther than in other areas of applied production economics it is obvious to all of us now that we would get a very poor estimate of production functions if we were to rely on survey data alone. I admit that in the case of fertilizer research we are dealing with very specific sub-production functions. Yet I can see no reason why we should expect higher order production functions to be better described by survey data.

The second reason why survey data are weak compared to information from other sources is frequently the inability of surveys to provide *usable* technical coefficients. Budgeting and its refinement, linear programming, are designed to furnish a skeleton of a production surface whereupon the economist tries to locate a scale line for a particular combination of input and output prices. Underlying a production surface constructed in this way are many so-called subproduction functions describing the relationship among such agents as land and fertilizer, land and seed, or inputs used in animal feeding. Such technical coefficients, which might never become explicit in the final budgeting or linear programming analysis, represent scale-line proportions of the inputs on these sub-production functions. Dr. McCorkle has made this point clear in his paper on linear programming as a tool in range economics research, which he delivered recently during the meeting of the council's range committee.

It is unlikely that survey data, even if they come from detailed case studies which Plath seems to consider to be superior to what he calls the general survey, will provide us with technical coefficients representing scale-line proportions.

I think that these considerations make a strong case for the use of experimental data, not solely to be sure, but in conjunction with and as a

check for survey data. Plath in his paper twice makes the unfortunate statement that physical input-output data are just what they are (namely physical) and as such have little value for economic studies.

The main purpose of experimental work in the production departments of our experiment stations would thus be to explore those areas of the relevant production surfaces not covered by survey data and furnish technical coefficients or at least provide a check for the technical coefficients furnished by survey data. I believe that this exploration of fringe areas is what we can call truly fundamental research. This type of research might in the short run be quite unrewarding, yet as became evident in fertilizer research during the past years there is a good chance that it might open completely new vistas in scientific investigation.

With respect to the ability of the survey method to deal with a highly dynamic problem such as range improvement and utilization Plath has left us in the dark. We should not blame him for this for there are at the present time no dynamic production models available and only if there were could we say something about the kind of data we would need to work with these methods.

There are other points in the paper that could be discussed here, in particular Plath's comparison between the usefulness of random as compared with stratified sampling. I will omit this discussion because these points are on a different plane and not directly related to the merits of the survey method as such.

REGIONAL DEVELOPMENT AND TRADE

Chairman: R. L. Mighell, Agricultural Research Service, USDA

THE EFFECTS OF INDUSTRIAL DEVELOPMENT ON TENNESSEE VALLEY AGRICULTURE, 1900-1950

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The two kinds of people on earth that I mean
Are the people who lift and the people who lean.
—ELLA WHEELER WILCOX

I. *Introduction*

DURING the past four years, our staff at Vanderbilt University has been engaged in a large-scale research project on Southern economic development, with particular reference to agriculture.[1] This project has been primarily concerned with the failure of the per-capita farm incomes in different communities to move toward equality over time and, indeed, their tendency to pull increasingly further apart.

We have recognized that "original" differences in the natural capabilities of the human agent, in community utility functions, and in land quality may give rise to differences in average farm incomes among agricultural communities. We have held, however, that such "original" differences can account for persistently increasing differences in farm incomes (and factor returns) only given imperfectly functioning factor markets. Indeed, our studies of the period 1850-1900 in the South Carolina and Georgia Piedmont, and in the Upper East Tennessee Valley have already demonstrated that—although such "original" differences did exist in 1860 among the counties of each area—the equilibrating effect of factor transfers (imperfect though they were) upon local agriculture were sufficient to offset almost completely the disequilibrating effect of these "original" differences by 1900.[2]

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[1] The original prospectus may be found in my article, "A Research Project on Southern Economic Development, with Particular Reference to Agriculture," *Economic Development and Cultural Change*, Vol. I, No. 3 (Oct. 1952), pp. 190-95. Our indebtedness to the seminal mind of Prof. T. W. Schultz will be obvious to those familiar with his recent writings. We are also deeply indebted to the Rockefeller Foundation, whose generous financial support made these studies possible.

[2] See Anthony M. Tang, "Farm Income Differentials in the Southern Piedmont, 1860-1940," *Southern Economic Journal*, Vol. 23 (July 1956), pp. 1-14; Tang's award-winning doctoral dissertation (Vanderbilt University, 1955), *An Analysis of Southern Economic Development, with Particular Reference to Agriculture: Upper Southern Piedmont*, which will be published in 1957; and my two-part article, "Some Foundations of Economic Development in the Upper East Tennessee Valley, 1850-1900," *Journal of Political Economy*, Vol. 54 (1956), pp. 277-302 and 400-415.

Despite this strikingly similar tendency toward convergence of per capita farm incomes among the counties of each study area during 1860-1900, intercounty differences in per capita farm incomes gradually reappeared and became increasingly greater during 1900-1950. Clearly, one must look for "dynamic" rather than "original" differences in community attributes to explain this more recent development. Our major hypothesis has been that the principal "dynamic" difference tending to lead to divergent average farm incomes among otherwise similar agricultural communities was the highly uneven incidence of local industrial-urban development. We have held this belief because of our expectation that the relative efficiency of local factor markets would be greater, the greater the degree of local industrial-urban development.

Thus, with reference to the labor market, we have hypothesized (a) that, in communities that have industrialized, the greater increase in alternative nonfarm job opportunities would increase the cost of (or value imputed to) the human agent in the nearby agriculture, forcing farm reorganization by which the productivity of the worker remaining in agriculture would be raised sufficiently to cover his higher cost; and (b) that, in similar communities that have had little or no industrial development, the rate of out-migration was not sufficient to raise labor returns in agriculture to a level comparable with those in the agriculture of the more industrial counties; hence, the lack of local nonfarm job opportunities has brought population pressure on the local land supply, a low valuation of the net contribution of labor to agricultural output, and excessive land values that serve as important barriers to internal farm reorganization on a higher productivity, higher income basis. For the capital market, we have hypothesized (a) that, in the communities that have industrialized, there has been an influx of nonagricultural capital which increased personal savings and strengthened the ability and willingness of local banking and credit institutions to provide the nearby agriculture with the additional capital required for its reorganization; and (b) that, in the nonindustrial counties, the capital required for local farm reorganization (even given a sufficient rate of outmigration) has been lacking because of less adequate personal savings, poorly developed banking and credit institutions, and the failure of additional capital resources to move in from more developed areas.

Space will not permit a full testing of these hypotheses, or even adequate statistical documentation of our more limited findings, at this time. Nonetheless, in the remainder of this brief paper, I propose to consider these matters with reference to a single Southern area, the Upper East Tennessee Valley, consisting of 20 contiguous counties east of Knoxville with a total land area approximating that of Massachusetts. I shall use

APPENDIX TABLE 1. COEFFICIENTS OF RANK CORRELATION BETWEEN PER-CAPITA VALUE ADDED BY MANUFACTURING 1947 AND VARIOUS AGRICULTURAL INDICES FOR 1900–1950, COUNTIES OF UPPER EAST TENNESSEE VALLEY STUDY AREA[a]

Item for 1900–1950 correlated with 1947 value added by mfg. per capita	1900	1910	1920	1930	1940	1950
% of male work force employed in agriculture[b]	−0.690**	−0.752**	−0.764**	−0.710**	−0.755**	−0.789**
Value land & bldgs. per acre, all farm-land	0.529*	0.373	0.547**	0.701**	0.690**	0.671**
% of all farmland improved[c]	0.142	0.143	0.105	0.180	0.456*	0.405*
% of all farmland in woodland	n.a.	−0.201	−0.134	−0.132	−0.245	−0.310
% of farms tenant-operated	−0.483*	−0.573**	−0.365	−0.132	0.219	−0.337
Per 1000 acres improved farmland:[c]						
Wheat production	0.728**	0.694**	0.848**	0.723**	0.634**	0.298
Oat production	0.165	0.253	−0.036	0.648**	0.657**	0.234
Corn production	−0.289	0.147	0.047	0.180	−0.137	−0.250
Tobacco production	0.048	0.126	0.555**	−0.051	−0.242	−0.477*
Hay production	0.614**	0.546**	0.415*	0.581**	0.224	0.453*
Fertilizer expenditures	0.792**	0.612**	0.782**	0.493*	0.445*	n.a.
No. of sheep	−0.144	−0.215	−0.006	0.110	0.271	0.185
No. of swine	−0.174	0.071	0.165	0.156	−0.068	0.459*
No. of all cattle	−0.026	0.114	0.014	0.014	−0.011	0.317
No. of horse and mules	0.104	0.269	−0.086	−0.214	−0.306	−0.441*
No. of tractors	—	—	n.a.	0.728**	0.549**	0.475*
Value of livestock	−0.173	0.356	0.191	−0.072	−0.168	0.241
Value of machinery and implements	0.659**	0.668**	0.618**	0.756**	0.577**	0.107[d]
Value of farm land and buildings	0.477*	0.403*	0.668**	0.562**	0.540**	0.540**[d]
Value of all farm capital	0.466*	0.395*	0.680**	0.538**	0.540**	0.543**[d]
No. of farm workers[b]	−0.067	0.033	0.241	−0.200	−0.590**	−0.398*
Value of farm products used or sold[f]	0.029	0.426*	0.565**	0.186	−0.057	0.237
Per farm:						
Acres of all land	0.145	−0.008	−0.202	−0.286	−0.323	−0.295
Acres of improved land[c]	0.196	0.235	0.126	0.233	0.162	0.184
Fertilizer expenditures	0.681**	0.544**	0.624**	0.423*	0.247	n.a.
Value of livestock	0.104	0.220	0.107	0.159	0.051	0.229
Value of machinery and implements	0.665**	0.552**	0.424*	0.629**	0.395*	0.018[d]
Value of farm land and buildings	0.389*	0.245	0.350	0.495*	0.501	0.523**[d]
Value of all farm capital	0.398*	0.242	0.302	0.468*	0.266	0.392[d]
No. of farm workers[b]	0.598**	0.407*	0.277	−0.237	−0.530*	−0.480*
Value of farm products used or sold[f]	0.126	0.511	0.232	0.179	0.051	0.254
Per farm worker:[b]						
Value of livestock	0.002	0.060	−0.158	0.155	0.456*	0.344
Value of machinery and implements	0.508*	0.450*	0.427*	0.672**	0.729**	0.943[d]
Value of farm land and buildings	0.195	0.179	0.331	0.543**	0.675**	0.704**
Value of all farm capital	0.162	0.188	0.316	0.489*	0.687**	0.723**[d]
Value of farm products used or sold[f]	−0.047	0.191	0.161	0.194	0.514**	0.526**[d]
% of improved farmland[c] in:						
Wheat	0.558**	0.633**	0.794**	0.692**	0.573**	0.174
Oats	−0.171	0.037	−0.306	0.657**	0.617**	0.202
Corn	−0.170	−0.218	−0.107	−0.332	−0.359	−0.358
Tobacco	0.109	0.170	0.539**	0.023	−0.281	−0.400*
Hay	0.492*	0.644**	0.498*	0.666**	0.245	0.272
Yield per acre:						
Wheat	0.623**	0.389*	0.498*	0.498*	0.664**	0.469*
Oats	0.441*	0.433*	0.403*	0.380*	0.502*	0.448*
Corn	−0.086	0.378*	0.251	0.349	0.295	0.088
Tobacco	−0.030	0.077	0.256	−0.346	0.130	−0.167
Hay	−0.019	−0.001	−0.286	−0.056	−0.230	0.249*

[a] Compiled or computed from decennial Censuses of Agriculture of 1900–1950. All production, value of product, and expenditure data are for the preceding year. Comparable data for 1850-90 may be found in my article "Some Foundations . . . ," *loc. cit.*, Table 8, pp. 296-97.

For 1900–1920, the "number of farm workers" was estimated from the estimated number of males 15 and over, *reduced* by the percentage of the combined population of all towns and hamlets reported by Rand McNally (*Standard Atlas of World, 1897* and Commercial or Business Atlases of 1901 and 1929) to total population; for 1930–50, the number of farm workers was taken to be the number of persons (including females) reported as employed in *farming* (not agriculture) by the Census of Population. For 1900–1920, the "male work force" is the estimated total male population of 15 years and older; for 1930–50, the number of males reported as employed by the Census of Population.

[c] For 1930 and 1940, "improved farmland" was assumed to include cropland harvested, idle, or fallow, and land experiencing crop failure as well as plowable pasture; for 1950, all cropland (except that used only for pasture) in 1950 plus plowable pasture in 1940.

[d] Since the value of farm machinery and implements was not reported by the 1950 Census, that part of farm capital was estimated for each county by increasing the 1945 value of machinery (as reported by the 1945 *Census of Agriculture*) both by (a) the percentage which the number of tractors and motor trucks on farms in that county in

per-capita value added by manufacturing in 1947 as my criterion of the degree of industrialization achieved by the several study-area counties. In order to identify the differential effects of industrial-urban development within my study area, I have computed correlation coefficients (Spearman's *rho*) between the ranks of the 20 selected counties in their 1947 per-capita value added[3] and their ranks according to numerous agricultural and related indices (mostly based on census data) in selected years between 1900 and 1950 (Appendix Table 1). The trends over time in these various rank correlation coefficients have proved to be highly effective in revealing important differences in the socio-economic characteristics of those counties that have enjoyed substantial industrial-urban development and those that have remained largely rural and agricultural since 1900.

In 1947, per-capita value added for the 20-county study area stood at 62 per cent of the national average, as compared with 27 per cent in 1929 and 15 per cent in 1899. (After a steady decline from 17 per cent in 1859, this percentage had reached a low of only 8 per cent in 1889). Two counties exceeded the national average in 1947, while four others had per-capita value added of 50-74 per cent of the national average. At the bottom of the scale, seven other counties had per-capita values added of less than 2 per cent of the national average. Half a century earlier, in 1899, only one county exceeded 50 per cent of the nation's average value added, with six counties falling below 5 per cent. During 1900-1950,

[3] The 20 counties, ranked from high to low in per-capita value added, were as follows: Sullivan $1,069; Carter $670; Washington and Smyth, Virginia $376-369; Hamblen, Unicoi, and Washington (Tenn.) $267-207; Cocke and Greene $167-123; Hawkins, Jefferson, Sevier, and Grainger $61-29; and Scott (Va.), Johnson, Lee (Va.), Union, Claiborne, Hancock, and Russell (Va.) $9-2. For detailed data for 1859-1947, see my articles, "Some Foundations . . . ," *loc. cit.*, Table 3, p. 282; and Table 1 in "Human Resources and Industrial Development in the Upper East Tennessee Valley, 1900-1950," to be published in *Quarterly Journal of Economics*, May, 1957.

creased during 1945–50 and (b) the percentage (51 percent) which the U. S. index of prices paid by farmers for motor vehicles and farm machinery increased during the same period.

[e] For 1950, certain data for all farms can be broken down into "commercial" and "other" (part-time and residential) farms. For these two classes of farms separately, the value of land and buildings per 1000 acres of cropland harvested was 0.435* and 0.678**; and per farm, 0.478* and 0.806**, respectively. The correlation between 1947 value added and percentage of "other" farms to total farms was 0.370.

[f] The total value of farm products had to be variously estimated for 1910, 1920, and 1950. For 1910, the estimation procedure was as follows: the total value of all crops, *less* the values of cereal crops and hay and forage, *plus* the sum of the values of animals sold and slaughtered, the value of livestock products (excluding home-consumed milk and cream), the value of wheat produced, and the net value of feed crops sold. For 1920, since the value of livestock and products sold and animals slaughtered were not reported, the value of all crops, including feed crops, was used. For 1950, since the value of home-consumed farm products was not reported, this was estimated by increasing the 1944 value reported in the 1945 Census of Agriculture by 27 percent (the increase in the U. S. index of prices received by farmers during 1944–49) and added to the reported value of farm products sold.

[g] The censuses of agriculture of 1940 and 1950 reported certain cash production expenditures whose deduction from gross value of farm product permits a partial approach to *net* value product. The 1949 expenditure data for counties include machine hire; livestock and poultry feed; livestock and poultry purchases; seeds, bulbs, plants, and trees purchased; gasoline and other petroleum fuel and oil; and farm machinery repairs; the 1939 expenditure data include livestock and poultry feed; livestock (but not poultry purchases; gasoline, kerosene, distillate, and oil (which was blown up to the "cost of operating motor vehicles" based on 1939 Tennessee and Virginia data for the latter in U. S. Dept. of Agr., *Income Parity for Agriculture*, Part VI, Sec. 1), and fertilizer and lime. These specified expenditures amounted to 22.4 and 18.9 percent, respectively, of gross value of farm products. The coefficients for "net" value of farm products (after deducting the above expenditures but before deducting the wage bill for hired labor) per worker were 0.448* in 1930 and 0.538** in 1949.

relative manufacturing employment in the study area increased from 6 to 23 per cent (and relative urban population from 5 to 23 per cent) while relative agricultural employment was declining from 84 to 30 per cent. To what extent, and in what ways, were these trends in the area's industrial-urban development reflected in its agricultural economy?

II. *Gross Farm Income per Farm Worker*

In 1899, today's more industrial counties did not have per-worker gross farm incomes significantly different from the less advanced counties, whereas by 1939-49 they definitely did so. The coefficient of rank correlation between 1947 per-capita value added and gross farm income per worker, after increasing from 0.19 to 0.29 during 1869-89, was virtually zero (−0.05) in 1899. Thereafter, it increased to 0.16-0.19 in 1909-19 and 0.51*-0.53* in 1939-49. This tendency was accompanied by increasing dispersion in per-worker farm income. In 1899, 11 of the 20 counties fell within ± 10 per cent, and 15 fell within ± 15 per cent, of the study-area average. By 1949, only 6 and 9 counties fell within these respective limits.

It is worth noting that the relationship between industrial development and average farm income had become significant by 1939-49 despite the inclusion of three counties whose peculiar agricultural attributes reduced substantially the correlation coefficients throughout 1869-1949. The first of these counties was Russell county, Virginia, which (primarily because of its relatively large farms and heavy livestock investment) had been able to maintain relatively high farm incomes even though it almost completely lacked industrial development. On the other hand, Carter and Unicoi counties—with their very small farms, rugged terrain and low livestock investments—were able to raise their average farm incomes relatively slowly in spite of considerable industrial development. Even so, during 1900-1950, Russell county's rank in gross farm income per worker *dropped* from second to seventh (it ranked last in 1947 value added) while Unicoi's *increased* from twentieth to ninth and Carter's from nineteenth to sixteenth. If these three counties are omitted from the analysis, the rank correlation coefficients become significant in all but one of the census years 1889-1949—0.27-0.29 in 1869-79, 0.73** in 1889, 0.390 in 1899, 0.43*-0.55* in 1909-19, and 0.70**-0.76** in 1929-49. In either case, the coefficients indicate an increasing tendency for today's more industrial counties to have higher average farm income as their industrial development proceeded apace.

It is also interesting to compare these coefficients (for all 20 counties) with coefficients involving other measures of farm income available in more recent years. First, "net" farm income (gross value of farm product

less certain production expenditures reported by the census) was also significantly correlated with 1947 value added in 1939 (0.448**) and 1949 (0.538**). Second, 1949 median net cash income (from all sources) of rural-farm families and unrelated individuals was much more highly correlated (0.7**) with 1947 value added than either gross or "net" farm income per worker. Finally, while the rural level-of-living index was relatively higher in the more industrial counties (the coefficient rising from 0.51* to 0.68** during 1930-40), their advantage narrowed (0.61** in 1950) as some of the amenities of life became more widely dispersed during the 1940's.

In 1949, our study area was primarily dependent upon tobacco and livestock for cash farm income. Tobacco accounted for 81 per cent of the area's cash sales of all soil products and 38 per cent of its cash sales of all products, including livestock. Livestock and livestock products accounted for fully 53 per cent. Today's more industrial counties derived significantly lower percentages of their cash farm income from tobacco (-0.510*) and significantly higher percentages (0.433*, or 0.748** excluding Russell, Carter, and Unicoi counties) from livestock. In 1939-49, corn, wheat, oats, hay, and tobacco together accounted for 91-96 per cent of the area's cropland harvested and 40-42 per cent of the "improved" farmland, of which most of the remainder (49-50 per cent) was "plowable pasture." During all or a major part of 1899-1929, today's more industrial counties had tended to have larger production of wheat, hay, tobacco, and corn per 1,000 acres of improved farmland but their differential advantage in these crops tended to be eliminated thereafter, with predominance in relative tobacco and corn production tending to pass the less advanced counties. Although the more industrial counties maintained differentially higher wheat and oat yields throughout 1899-1949, first attaining significantly higher hay yields in the latter year, their earlier advantage in corn and tobacco yields tended to disappear or (for tobacco) pass to the less advanced counties.

Offsetting the more industrial counties' declining differential advantage in crop production, however, was their increasing relative position in livestock production. Whereas in 1900 and earlier, they had tended to have no more (or even fewer) cattle, sheep, and swine per 1,000 acres, during the next half century they increasingly tended to have relatively larger livestock numbers, with particularly large differential gains in swine and cattle during 1940-50. The only exception to this trend was horses and mules per 1,000 acres, in which the more advanced counties tended to lead as late as 1910, while showing an increasing tendency thereafter to have *fewer* draft animals per 1,000 acres than the less advanced counties. Thus, today's more industrial counties mechanized their agriculture

more rapidly although, during 1930-50, their differential in tractors per 1,000 acres declined as mechanization spread to the rest of the area.

Of these crop and livestock trends, the trends in tobacco production are of greatest interest. Tobacco production in the study area first exceeded one million pounds in 1889, when Washington (Va.) and Greene counties together accounted for 63 per cent of about 2.0 million pounds produced; in 1899, the same two counties produced 71 per cent of a slightly smaller total. By 1909, Greene county alone produced 64 per cent of the area's total production, becoming the nucleus from which burley tobacco culture spread to the rest of the area. By 1929, when total production had increased over twelve-fold, it required seven counties (largely centered around Greene county) to account for 69 per cent. With the further spread of tobacco culture into Scott, Russell, and Lee counties during the 1930's, nine counties in 1939 (and ten in 1949) were necessary to account for 70-71 per cent of the area total.

These shifting production patterns had interesting effects on the rank correlation between 1947 value added and tobacco production per 1,000 acres of improved farmland. From a peak of 0.66** in 1879, this correlation coefficient became nonsignificant in 1899-1909, then regained a significant positive level (0.56**) in 1919. Thereafter, the coefficient fell sharply and by 1949 was significantly negative (− 0.48*). These striking shifts suggest the following interpretation. Today's more industrial counties, given their higher levels of educational achievement, were able to innovate in the production of a newly important crop. But, as they industrialized, a declining labor force and increasing labor costs eliminated their comparative advantage over their less advanced neighboring counties. As a result relative tobacco production increasingly passed to the latter counties where, given a continuing lack of nonfarm job opportunities and consequently low opportunity costs, their farm labor force could still afford to concentrate upon this labor-intensive crop. Contrary to this explanation, however, is the fact that, even during the dynamic 1940's, (a) every county in the area maintained or expanded its absolute production of tobacco, and (b) the more industrial counties did not expand their total production significantly less (− 0.17) than did the less advanced counties. Even so, the trends in the relationship between 1947 value added and tobacco production indicate that this interpretation, even though not yet validated by recent history, is a portent of the early future in our study area.

III. *Total Capital per Farm Worker*

In 1900-1910, today's more industrial counties had no significant advantage (0.16-0.19) over the less advanced counties in total capital per

farm worker, despite their superiority (0.56* in 1870) in the earlier period, 1850-80. However, during 1910-50, their modern period of industrialization, today's more industrial counties regained and steadily increased their differential advantage, with coefficients of 0.69** −0.73** by 1940-50. Of the top secen counties in 1947 value added, all but two showed substantial gains in rank in their capital per farm worker during 1900-1950. The rank of Sullivan county—which had experienced the most spectacular industrial development after 1900—rose from ninth to first while Carter and Unicoi, despite their highly unfavorable agricultural attributes, had even larger gains from fifteenth to fourth place and from twentieth to tenth, respectively. In 1900, four of the five Virginia counties had ranked among the top five in capital per worker, reflecting their larger farms and better developed livestock enterprises at the beginning of the century. Although all Virginia counties dropped in rank during 1900-1950, the two (Washington and Smyth) experiencing considerable industrial-urban development remained in the top six. On the other hand, despite their relatively favorable agricultural resource organization and the rapid growth of nonfarm employment in their coal mines if not in manufacturing, Russell county fell from second to seventh place and Lee county from fourth to sixteenth.

If we once more eliminate Carter, Unicoi, and Russell from the analysis, we find that 1947 value added and capital per farm worker were significantly correlated throughout 1860-1950. Even so, a pattern of initial convergence and subsequent divergence remains, the coefficient declining from 0.69**-0.76** in 1870-90 to a low of 0.559** in 1900, then increasing to 0.70**-0.72** in 1910-20 and 0.80**-0.83** in 1930-50. Thus, even after eliminating the three counties, we find that, as they industrialized during 1900-1950, today's more industrial counties won a steadily increasing advantage over the less advanced counties in capital per farm worker.

But what of the several components of total farm capital—real estate investment, livestock investment, and machinery investment? Real estate investment per farm worker was significantly larger in today's more industrial counties in 1860-70 (0.51*-0.55*) but not in 1900-1910 (0.18-0.21). Thereafter, the relative advantage of the more advanced counties rapidly increased, with coefficients of 0.67**-0.70** in 1940-50. Because of the dominant importance of real estate in the study area's total farm capital, differences in land values accounted for much of the differences in both real estate and total investment per farm worker. Thus, between 1850 (0.65**) and 1910 (0.37), today's more industrial counties experienced some decline in their land values relative to the less advanced counties but, with a resumption of their industrial development thereafter, their

tendency toward higher land values was revived and strengthened, with coefficients of 0.67**-0.70** by 1930-50.

On the other hand, during 1860-1900 there was some tendency for today's more industrial counties to shift from having relatively fewer to having relatively more acres of land (and more farm workers) per farm, whereas by 1940-50 they once more tended to have fewer acres (and fewer farm workers) per farm than the less advanced counties. In 1950, when the coefficient for acres of all land per farm was 0.30, the coefficients for commercial and other farms were −0.06 and −0.49*, respectively, indicating that the more advanced counties' full-time farms were not significantly smaller but were heavily outweighed by their numerous part-time and residential farms when all farms were combined. Furthermore, in 1950 the commercial farms of today's more industrial counties did have significantly more acres of *cropland harvested* per farm (0.38*) while their part-time and residential farms did not (−0.15). Nonetheless, it was their part-time and residential farms which showed a much greater relative advantage in per-farm real estate investment (0.81** as compared with only 0.48* for commercial farms), even though it was this class of farms which largely accounted for the more industrial counties' relatively small average size of farm. (The difference in the coefficients for part-time and commercial farms virtually disappeared, however, if Carter, Unicoi, and Russell were eliminated, resulting in coefficients of 0.82** and 0.80**, respectively).

At the outset, we formulated a hypothesis that farmers of the less advanced counties would, given the heavier pressure of farm population on a limited land supply, tend to bid up the value of farmland (relative to its productivity) further than would farmers in the more industrial counties. It is obvious, however, that in the latter counties there has also been increasing pressure on farmland values as a result of urban, residential, and other nonfarm sources of demand for land, thereby obscuring possible differences in the value of land for agricultural uses. However, it is interesting to note that total real-estate investment per acre of *improved farmland* (cropland and plowable pasture) was less highly correlated with 1947 value added (0.54**-0.56**) than was real-estate investment per acre of *all* farmland (0.67**-0.70**) during 1930-50. Furthermore, in 1950, the commercial farms of the more advanced counties showed a substantially smaller tendency (0.44*) to have higher real-estate investment per acre of *cropland harvested* than did their part-time and residential farms (0.68**), which were presumably nearer to urban centers where competition of nonfarm land uses was more intense and on which the farm residence (nonproductive capital) accounted for a larger part of the total real-estate investment. Finally, in 1950, the ratio of the high

to low county in per-acre real-estate investment was 3.7 for all land on part-time and residential farms but only 2.2 for cropland harvested on commercial farms.

Unfortunately, although instructive, these findings are not adequate for satisfactorily testing our hypothesis about excessive land values in the less advanced counties. Indeed it is quite possible that, as late as 1950, our hypothesis still applied to the entire study area rather than only to the less advanced counties. For all farms combined, the average value per acre of all farmland in the study area was 166 per cent of (with 16 of the 20 counties higher than) the national average and the real-estate investment per acre of improved farmland was 129 per cent of (with 19 of the 20 counties higher than) the national average. These facts probably reflect in part the tendency for federal tobacco allotments to be capitalized into the study area's land values. They are also consistent with Professor Hughes' recent analysis[4] of the multiple regression of net farm income produced on real-estate, livestock, and machinery investment in 1950-51 for 80 owner-operated farms in Greene county, which ranked eighth among our counties in 1947 value added. Hughes found a *negative* net regression of real estate investment upon income, indicating that, "as investment in real estate increased, larger proportions of the land were put to unproductive uses and the efficiency in the use of other resources diminished." This result he attributes to the fact that the better-financed farmers tended to overinvest in land, part of which they rented out even though their family labor force was underemployed, although an intensification of their ratio of animal units to open land (and associated changes in cropping methods) would have substantially increased their net incomes.

We have already noted that today's more industrial counties derived a significantly larger percentage of their gross cash farm income from livestock and that they were increasingly tending to have more livestock numbers per 1,000 acres of improved farmland. Even in 1950, however, the latter tendency (per 1,000 acres) was significant only for swine numbers (0.46*), with coefficients of 0.32 for cattle, 0.19 for sheep, and 0.24 for value of livestock (including horses and mules). For value of livestock per farm worker, the coefficient was rather erratic over time, rising from −0.20 to 0.13 during 1860-80, declining to nearly zero in 1890-1910, climbing rapidly to 0.46* in 1940, then dropping back to 0.34 in 1950. However, it should be emphasized that, if we exclude Carter, Unicoi, and Russell, the coefficient for 1950 increased from 0.34 to 0.82.** Thus, while today's more industrial counties (like Greene county, accord-

[4] R. B. Hughes, Jr., "Population Adjustments and Economic Status of Southern Farmers," manuscript to be published by the University of Tennessee.

ing to Hughes) still probably fell substantially short of the livestock intensity rate that would have maximized their net farm incomes, they were at least beginning to show a relative advantage in livestock investment per farm worker[5] over the less advanced counties. Finally, during most of 1850-1950, today's more industrial counties had a significantly higher value of farm machinery and implements per worker. From a high of 0.54* in 1850-60, the coefficient declined to only 0.32 in 1890, ranged from 0.43* to 0.51* in 1900-1920, and improved substantially to 0.67**-0.73** in 1930-40. If our crude estimates of 1950 machinery investment are correct, however, the coefficient declined to only 0.25 during the 1940's.

Throughout 1870-1950, current gross farm income per worker and current total farm capital per worker were highly correlated for the 20 counties of the Upper East Tennessee Valley. This rank correlation coefficient steadily increased from 0.56* to 0.84** during 1870-1900, dropping to 0.65** in 1910. Thereafter, it increased to 0.87** in 1940, then declined slightly to 0.77** in 1950. At no time during 1870-1950 (except 1870) was either of these two indices as highly correlated with 1947 value added as they were with each other, although the differences in the coefficients were definitely greatest in the intermediate years around 1900. Thereafter, as the lead in both farm income and farm capital per farm worker increasingly tended to pass to those counties which were enjoying industrial-urban development, these differences narrowed substantially through 1950. In the latter year, the correlation between 1947 value added and current capital per farm worker was nearly as high (0.72**) as that between current farm capital and current farm income per worker (0.77**), although the correlation between 1947 value added and current farm income per worker was still substantially lower (0.53*). After Carter, Unicoi, and Russell are eliminated, however, the respective coefficients—0.83**, 0.86**, and 0.76**—were very similar in 1950.

IV. *Adjustments in Local Factor Markets*

Our previous analysis has made clear that those counties that experienced industrial-urban development after 1900 gained a steadily increasing advantage over the continuing rural-agricultural counties in both total farm capital and gross farm income per farm worker. That this should have been true is all the more remarkable in light of the fact that there was a substantial and accelerating factor movement throughout

[5] In 1950, for the study area as a whole, the value of livestock (including horses and mules) per farm worker was only 54 per cent of the national average and no county exceeded the national average, Smyth and Russell counties coming closest with 94 and 89 per cent, respectively; but the value of livestock per 1,000 acres of improved farmland was 119 per cent of (with 15 of the 20 counties above) the national average.

1900-1950 that should have tended to narrow rather than widen the differences in per-worker farm capital and farm income during the fifty-year period.

Most notable here was the pattern of human migration. Except during 1870-80, the study area as a whole experienced net out-migration in every decade from 1840-50 to 1940-50, with an average loss of population per decade by out-migration of 14 per cent during 1900-1920, of 6 per cent during 1920-40, and of 12 per cent during 1940-50. Furthermore, from 1890-1900 on, few individual counties (the most frequent exceptions were Sullivan, Hamblen, and Washington [Tenn.] counties) showed any net in-migration, although it was not uncommon for some of the less advanced counties to lose 20 per cent or more per decade through out-migration. During 1900-1950, however, today's more industrial counties showed an increasing tendency to have lower rates of net out-migration. The coefficient of rank correlation between 1947 value added and relative net out-migration, after steadily increasing (nonalgebraically) from +0.11 to −0.52* during 1840-1900, continued to increase to levels of more than −0.80** in 1920-30 and 1940-50.

As I have shown clearly elsewhere,[5a] this out-migration was also age selective for the total populations of both males and females, tending to drain the less advanced counties more heavily of adults in their most productive years—a factor which, if true of the rural-farm population as well, would tend to strengthen the tendency of the more industrial counties to have higher farm labor productivity because of the higher "quality" of their farm workers. However, insofar as local nonfarm employment was also age selective, this latter factor would work in the opposite direction and might even become the dominant factor.[6] In any case, because of their persistently higher fertility rates and larger families throughout 1850-1950, the less advanced counties tended to maintain a relatively large farm population in spite of heavy out-migration. Thus, today's more industrial counties already had significantly fewer births per 1,000 females of child-bearing age in 1880 (−0.48*), when they were still almost wholly rural and agricultural. By 1940, the tendency had been greatly strengthened (−0.80**) although it declined somewhat (to −0.62**) during the 1940's. Since these differences in fertility clearly antedated the study area's modern period of industrial-urban development, they may be nearly as much cause as effect of the more industrial

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[5a] In my article, "Human Resources . . . ," *loc. cit.*

[6] Cf. Vernon W. Ruttan's award-winning article, "The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast," *Journal of Farm Economics*, Vol. 37 (1955), p. 48. Professor Ruttan rationalized his finding of a *negative* relationship between average income per farm worker from farming and the percentage of the farm population engaged in nonfarm work on the grounds of the age selectivity of local nonfarm employment.

counties' later economic progress. As a resultant of these several forces, in 1940-50 today's more industrial counties had significantly fewer farm workers per farm (-0.53^{*} and -0.48^{*}) and per 1,000 acres of improved farm land (-0.59^{**} and -0.38^{*}), while the reverse had been true in 1900 (0.60^{**}) for the former and in 1920 (0.28) for the latter.

As to equilibrating movements on the capital side, the sparsity of data permits few generalizations. Today's more industrial counties had significantly larger (primary) bank deposits per capita throughout 1900-1950, the coefficient increasing from 0.72^{**} to a high of 0.77^{**} in 1920. Surprisingly enough, however, the relationship was substantially weakened thereafter (0.73^{**} in 1930, 0.62^{**} in 1940, and 0.53^{**} in 1950), suggesting that the industrial counties' large influx of nonagricultural capital was not sufficient, on a per-capita basis, to offset the spread of banks to, and the increasing use of banks in, the less advanced counties, whose cash farm incomes were increasingly enhanced by their shifts to tobacco production. It is clear, however, that the more industrial counties enjoyed one important advantage on the capital side—that is, their significantly greater investment of social capital in the education (hence productivity) of their youth. Thus, during 1850-1950, except for a temporary post-bellum setback in 1850-1880, their school expenditures per school child were persistently greater than those of the less advanced counties, with coefficients of 0.60^{**} in 1850, 0.58^{**} in 1900, and 0.70^{**}-0.74^{**} in 1920-50. They thereby maintained the "quality" of their population through heavier educational investments (and lower fertility rates) even during their period of economic retrogression (1860-1890) and steadily strengthened their advantage over the less advanced counties as they experienced industrial rebirth after the turn of the century.

V. *Conclusions*

Our analysis, incomplete though it is, leaves no doubt that local industrial-urban development has brought with it higher farm capital and farm income per farm worker. Thus far, however, the favorable impact of industrialization on farm families of the Upper East Tennessee Valley has been transmitted through the labor market (thereby reducing the denominator of these indices) much more than through the capital market, by which total (real) farm capital or total (real) output (the numerator) would be increased. Of the several components of farm capital, it is primarily livestock investment that industrial development has served to increase, to the benefit of the productivity and income of nearby farmers.[7]

[7] These conclusions are fully consistent with Ruttan's (*loc. cit.*, p. 56) for a much broader area of which our study area was a relatively small part.

Even so, much more remains to be done if our study area is to close the gap that still exists. In 1950, the average farm worker in our study area still had 41 per cent less real estate investment, 46 per cent less livestock investment, and 48 per cent less machinery investment than his national counterpart. In gross farm output (income) his relative showing was even worse and deteriorating—54 per cent less than the national average in 1950 as compared with 44 per cent less in 1930-40. In 1950, only 6 of our 20 counties had output (income) per farm worker in excess of 50 per cent of the national average. Of these six counties, five ranked among the top seven in value added, in spite of which their output (income) per farm worker was only 54-62 per cent of the national average. At the other extreme, five counties (three in the bottom seven in value added) had an output (income) per farm worker of only 29-39 per cent of the national average.

If off-farm sources of income are included, however, the picture is not nearly so black. Thus, in 1949, of the seven counties ranking highest in per-capita value added, the two top counties (Sullivan and Carter) had for their rural-farm families median net cash incomes from all sources of 97-98 per cent, and the remaining five counties median incomes of 80-93 per cent, of the national average. All but Unicoi and Carter counties also ranked in the top seven in gross farm output (income) per worker and the ranks of these two counties were raised from ninth to fourth and from sixteenth to first, respectively, when off-farm income was taken into account. Of the seven counties ranking lowest in per-capita value added, all had median rural-farm family incomes of only 50-62 per cent of the national average. All but Russell, Johnson, and Claiborne counties also ranked in the bottom seven in gross farm output (income) per worker and the first two counties' ranks were lowered from seventh to fifteenth and from eleventh to fourteenth, respectively, when off-farm income was included.

We may conclude that, although industrial-urban development in the study area has thus far fallen far short of raising farm capital and farm income per worker to national levels, it has (more importantly) gone a long way toward eliminating the interregional differential in farm family incomes from *all* sources. Thus, only by the continued industrial development of low-income rural areas—reinforced by much more vigorous and imaginative public policies for facilitating the mobility of farm people and farm capital—can the problem of rural poverty in the Southern region finally be fully overcome.

PRICE SUPPORT PROGRAMS AND INTERREGIONAL COMPETITION*

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THIS paper attempts to discuss the problems involved in assessing the impact of price support programs on interregional competition in agriculture and to develop certain hypotheses about the effect of price supports on regional competitive structures. Given the complexity of the subject and the shortage of raw material from which to draw conclusions about past programs, I will not attempt in most cases to develop conclusive empirical results.

I

Evaluation of the interregional implications of price programs suggests itself for two reasons. First, the price and production control features will cause income adjustments that extend not only to farmers who produce supported commodities but also to farmers producing unsupported commodities. The multilateral nature of interregional trade for agricultural products within the United States results in a complex price system that tends to bind all farmers together into a single competitive structure. "Free market" contact among regional groups will spread the impact of price programs so that the income obtained by most farmers will ultimately be affected if the price of any major commodity or group of commodities is supported.

Another reason for concern with the interregional implications of price programs lies in the permanent effect that such programs may have on regional production characteristics. Some groups may emerge from a period of price supports with a permanent advantage that they might never have obtained or would have been obtained much more slowly and at greater cost under free market conditions. Many of the adjustments that producers make to counter acreage restrictions are irreversible and can cause a permanent change in the locational structure of agricultural production. To society, these changes may be either desirable or undesirable. Permanently lowered production costs through the effect of programs on adoption of technology and the realignment of asset ownership within agriculture may reduce prices to consumers. On the other hand, if price programs vitiate cost-reducing changes or cause changes in asset ownership that increase production costs, society may be

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burdened with higher priced food and fiber for many years after price programs are discontinued. Moreover, the change in asset ownership may be in accordance with or counter to the goals of society respecting changes in income distribution.

II

An initial step that cannot be avoided in discussing price support programs and interregional competition is that of defining a framework that states realistically the nature of the problem under consideration. The general framework that best describes the basis for production adjustments in agriculture is one that considers the firm as the only natural decision-making unit. Establishing price programs is group action in its broadest sense. The assumption of autonomous action by firms means then, that even with this kind of group action, farmers will continue to make production decisions independently and will treat restrictions or conditions caused by price programs as part of a set of conditions that make up the framework within which they operate. Price programs, in a sense, become structural components that farmers individually accept in making output decisions, just as they accept the fact that the free market provides them with a given set of prices upon which their own production or marketing activities will have no perceptible effect. That farmers are price responders in either case is emphasized here because this provides the basis for developing directly a statement of the kind of aggregation that can be dealt with in evaluating the regional implications of agricultural price programs.

A region can be defined as any geographical area with sufficient homogeneity to provide similar production possibilities for all farmers within the area. This definition permits the delimiting of regional groups on the basis of location and predominant type of farming.

The importance of adding homogeneity to the spatial concept as a criterion for aggregation is illustrated by the difference between the role that wheat plays in farm organization in Eastern and Western Kansas. Farmers in Eastern Kansas can successfully produce either wheat or livestock. In Western Kansas, the return to factors is much greater in wheat than in other enterprises, with the result that specialization in wheat is almost complete. This difference has two important implications: (1) the response of Western Kansas farmers to price changes will differ from the response of farmers located in Eastern Kansas, and (2) the nature of the competitive link between each group and other regional groups is different. For all practical purposes, Western Kansas competes with other areas only in the production of wheat and will not move toward any other enterprise short of extremely wide price shifts. Eastern Kansas

competes through livestock and wheat, and can shift more easily toward whichever enterprise gains an advantage.

To evaluate the effect of price programs on a regional basis, it is necessary to specify for each region included in the analysis both a demand relation that states the nature of the market and a supply relation that shows how output is determined.[1] The components of each of these relations at the regional level are complex. The demand relation includes the effect of transfer costs and production decisions made by farmers in other regions, the level of demand within the region relative to quantity produced, and certain characteristics of total market demand. The production relation is equally complex and includes among other things such structural components as institutional arrangements, tenure relationships, and natural and biological factors which condition the agricultural economy of a region.

Changes in the interregional competitive structure due to price programs will occur through adjustments in either one or both of these sets of relations. The extent of the change will depend on: (1) The impact that price programs have in reshaping markets and in establishing restrictions that farmers must accept as given in making output decisions, and (2) the response that farmers make to these changes. To have regional implications, the structural changes must be such that a nonrandom response is created amongst groups of homogeneous producers.

III

Since support programs exist for the purpose of changing market prices, the questions to be answered once the decision to tamper with prices has been made are: Who will lose? Who will gain? and how much? These questions must be faced in selecting the kind of support program to adopt, the method of regulating production, and the way in which prices are to be calculated and made effective.

Tying prices to historical relationships ignores regional and commodity price trends that may have been under way prior to the institution of supports or that may become desirable during the period when price

[1] The formidable nature of these requirements undoubtedly explain why so few empirical studies are available in this area. The author is aware of only one study which attempts a complete analysis of interregional competitive relations. This is: Ronald L. Mighell and John D. Black, *Interregional Competition in Agriculture With Special Reference to Dairy Farming in the Lake States and New England.* Recent contributions in the development of spatial equilibrium models shed considerable light on interregional demand relations but fall short of a complete analysis in that supply conditions are ignored. Empirical studies of note are Karl Fox, "A Spatial Equilibrium Model of the Livestock Feed Economy in the United States," *Econometrica,* Vol. 21: 547-556, 1953, and George Judge, *Competitive Position of the Connecticut Poultry Industry,* Connecticut, Bulletin No. 318, January 1956.

supports are in effect. Failure to make adequate adjustment to trends in commodity prices is relevant in interpreting the case of wheat in the present price support dilemma. Analysis of production and price trends during the period 1911 through 1950 indicates that the cost of producing wheat has declined more rapidly than the cost of producing many other commodities throughout the last two or three decades. With free markets and with sufficient time for adjustment, this shift would be reflected in a substantial decline in the general level of wheat prices relative to many other farm commodities. Failure to fully recognize this trend in price support operations provides at least a partial explanation of the present excessive wheat stocks.[2]

Of even greater importance for many commodities than administered price-level adjustments is the impact that programs have on price certainty. The importance of reducing or eliminating price variability will vary with the magnitude and frequency of free market price fluctuations. Stabilization of potato prices, where extreme price inelasticity of demand results in wide price swings between production periods will create a different adjustment response than stabilization of feed grain prices where short-term fluctuations are less important. The most important cause of differences in price variability is intercommodity variations in demand elasticity. Different price flexibility patterns, however, are not limited to those caused by intercommodity demand characteristics. Regional differences for a given commodity may exist due to differences in degree of market isolation resulting from transfer costs attached to competing imports from other regions. A more general case of locationally introduced differentials is that associated with distance from market. The derived demand curve facing producers will be related to demand at the consumer level and will have a lower average elasticity determined by the total of transfer costs from farmers to consumers. Thus, relative price variations to producers far from the market will be greater than to nearby producers.

Relative variability of factor and product prices should not be overlooked in assessing interregional implications of price stability. Product price stability will increase rather than decrease income variability in commodities where a high correlation exists between factor and product prices. This relationship is discussed by Johnson[3] as it applies to the

[2] During the period 1910-1914 to 1952-1955, wheat prices increased only moderately less than the all-commodities index of prices received by farmers. Increases in wheat prices were greater than for feed grains but less than for livestock products. Both "flexible" supports and the "new parity" help overcome the problem of keeping up with free market price-level adjustments but without complete success.

[3] D. Gale Johnson, "The Supply Function for Agricultural Products," *American Economic Review*, September 1950.

apparent inelasticity of production response to price level changes during depression periods. Its implications for shorter term price adjustments probably are less important but are particularly relevant in poultry and livestock where farm-produced feed is a major input.

Program induced changes in price level and price variability both among commodities and among regions in a given commodity have important consequences in regional competitive relationships. The effect of regional price shifts for a given commodity is direct in the sense that it applies to spatially separated groups who compete directly in the market. Intercommodity implications, on the other hand, arise through output responses that originate with farmers producing supported commodities and that in turn cause widespread adjustments extending to many farmers not directly affected by the program. Supporting wheat prices, for example affects the adjustment between wheat and livestock by farmers in wheat-livestock areas. A direct competitive link may exist between these areas and producers in other regions where farm adjustment problems center around the relative amount of resources that should be committed to dairy and to livestock. Dairy producers in these areas, in turn, may have direct commodity links with other regions where dairy is combined with still other enterprises. Viewed within the total framework of selective price support programs, intercommodity competition is closely related to the diverted acreage problem. Farmers shift acres into the nearest alternative and increase the output of a commodity upon which no restrictions exist thereby forcing its price downward.

IV

To this point, we have dealt largely with the first of the relations that is necessary for analysis of regional competitive structures. The fact that any conceivable set of administered prices will cause market adjustments that have unequal consequences to different regional groups is easily established. The real problem is not to specify that differences will exist, but rather to delineate these differences in a way that will permit meaningful interpretations that might provide the basis for improving future political and administrative decision making.

Although our understanding of farmers' objectives and their economic behavior is substantially incomplete, a few safe generalizations can be made. It seems safe, for example, to assert that farmers prefer more rather than less income. This causes them to seek optimal adjustment of their farm organization with a given set of resources and technologies. It also causes them to introduce new methods, new technologies, new and more productive resources into their farm plan except where these changes are prevented by personal subjective considerations or by conditions that,

at least for the period under consideration, are beyond the control of individual farm managers. These conditions may include unfavorable institutional arrangements, noncontrollable natural or biological factors, risk and uncertainty situations associated with market-price fluctuations, inadequate capital, a lack of managerial skill and know-how, and numerous other items. A second generalization that seems safe is that farmers prefer a more, rather than a less, regular flow of income and will sacrifice in level of income to obtain stability. Price programs are acceptable only if they represent a means of achieving a higher or more stable income than that anticipated under free markets.

Farmers attempt to reduce income uncertainty by building safeguards into their farm business organization. In regions where close alternatives exist, this may take the form of enterprise diversification. Where no close alternatives exist, it typically takes the form of an altered resource mix that results in reduced expenditures on capital inputs. In making these adjustments, farmers reduce their product output in value terms and accept a lower average level of income. To the extent that these adjustments result from price uncertainty, the price stability caused by support programs will alter the relationship between relative price levels and the quantity of commodity outputs. In areas and in commodities where highly productive capital inputs have been kept out of the resource mix in large quantities, the chance to improve income by rearranging inputs is greater than where built-in price safeguards are less important.

The overriding importance of price uncertainty, at least for some commodities, seems to have been well established by the tobacco study made by Johnson in Kentucky,[4] the dry bean study by Hathaway in Michigan,[5] and the regional potato study centered in Minnesota.[6]

Due to widespread locational distribution of concentrated areas of production the interregional implications of differences in the effect of price uncertainty are observable in the case of potatoes. For convenience, the different areas can be dealt with as two homogeneous types. These are specialist areas that include producers in Maine plus Idaho and several other Western states, and Dairy Belt states including Minnesota, Wisconsin, Michigan, Ohio, New York, and Pennsylvania. When price

[4] Glenn L. Johnson, *Burley Tobacco Control Programs*, Kentucky Agricultural Experiment Station, Bulletin No. 5E, February 1952.

[5] Dale E. Hathaway, *The Economic Effects of the Price Support Program on the Dry Bean Industry in Michigan*, Michigan Agricultural Experiment Station, Technical Bulletin No. 250, April 1955.

[6] Roger L. Gray, Vernon L. Sorenson, and Willard W. Cochrane, *An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States*, Minnesota Agricultural Experiment Station, Technical Bulletin No. 211, June 1954.

supports were initiated, production in the specialist states was based on farm organization that included potatoes as a major enterprise. Most producers in the Dairy Belt states, on the other hand, included potatoes as a minor or sideline enterprise.

If the proposition holds that farmers prefer to take a small chance rather than a big chance, then it can be concluded that production was less conditioned by uncertainty considerations in the Dairy Belt states than in the specialist areas. The relative adjustment by producers in these separate groups of states indicates that this was the case. During the price support years 1942-1950, output in the specialist areas nearly doubled whereas production in nonspecialist areas declined slightly. This occurred despite the fact that neither group obtained any apparent price level advantage.

Adjustments in output due to price programs arise primarily in two ways. These are (1) changes in the makeup of factor inputs committed to production, and (2) changes in the quantities of a given mix of resources allocated to production. In regional aggregates, expansion through committing additional quantities of identical resources can occur both through intrafirm adjustments and through entry of new firms using identical production techniques. Expansion through the entry of new firms fits traditional equilibrium theory, but has not been important in agriculture in recent years except in certain notable instances of locationally oriented growth of new enterprises. Expansion of cotton production in California and New Mexico is a case in point. The number of farms producing cotton in these two states increased from 7,000 to nearly 12,000 from 1934 to 1949.[7] Under price programs, new firms are permitted to enter by virtue of administrative decisions that normally reserve part of each state allotment for allocation to new producers. The extent to which this results in a reduction of acreage to other growers within the state or whether interstate shifts are permitted is very difficult to determine. Conclusions can be drawn only through a thorough study of the administrative process of allocating acreage among states and producing areas.

Output can be expanded by applying additional quantities of an identical bundle of resources on farms already producing a supported commodity only if price programs are adopted without acreage restrictions. This appears to have been the major initial response of potato producers to price supports during the early phases of the program when acreage restrictions were not imposed. Between 1942 and 1943, United States production increased by approximately 24 per cent due to an increase in acreage of 21 per cent and an increase in yield of only 3 per cent.

[7] Census estimates.

However, when acreage restrictions are used to limit output, it follows that the quantity produced cannot be increased by using additional amounts of an identical bundle of resources. In this situation, output adjustments result only from a realignment of input factors and adoption of techniques that increase the output from a given quantity of land. These changes may represent movement to a new set of input-output ratios within the framework of a given existing set of available technologies, i.e., factor substitution, or the adoption of improved technologies that result in a new set of attainable input-output ratios lower than those existing previously. The adoption of new technology will usually cause a substitution effect resulting in use of additional units of capital relative to land and labor—but not always.

Although the net relation between the change in total capital inputs and the change in land and labor provides a good indication of the rate at which production costs are reduced, it is necessary to look behind the specific form of the change in any region to determine the precise effect on cost structures. Heavier application of fertilizer may be associated with diminishing returns and increasing costs where fertilizer is an independent addition to capital inputs. On the other hand, if the additional fertilizer is associated with adoption of a new seed variety, use of irrigation, or changes in other practices that result in a new and lower set of attainable input-output ratios, the cost-increasing effect of additional fertilizer may be obscured.

The relative adaptability of capital-increasing and/or cost-reducing changes in different regions will vary with the specific form of the change available. Replacing labor with machinery may not be feasible on small acreages. Low cost irrigation is often dependent upon the development of local power resources. New varieties of seed may increase output without any additional outlay of funds and will be equally adaptable to low and high income areas or small and large acreages.

Changes in output per man hour and per acre provide a guide to differences in the rate at which new and better capital is applied to production. Table I illustrates recent wide differences that have existed between Eastern and Western cotton producing regions.

Western cotton producers appear to have increased the use of both labor-saving and yield-increasing capital more rapidly than producers in the East South Central area. Similar wide regional differences exist in a number of other crops.

Price programs influence the rate at which farmers commit additional capital to production by changing the economic environment within which they operate. If the application of additional capital is restricted severely by price uncertainty under normal competitive conditions, the adjustment caused by price programs will be rapid and usually of major

TABLE 1. COTTON: PER CENT INCREASE IN OUTPUT PER MAN HOUR AND PER ACRE SELECTED REGIONS

Region	Increase in output per man hour—ave. 1945–49 to 1950–54	Increase in output per acre—ave. 1945–49 to 1950–54
	(Percent)	(Percent)
E. S. Central	+4	+5
Pacific (California)	+45	+14

Sources: Changes in Farm Production and Efficiency, Annual Summary 1955 and Supplements ARS 43-15, June 1955; and Agricultural Statistics.

proportion. Limitation due to the inability to accumulate assets as a result of unfavorable price-cost relationships will be relieved more slowly as the cumulative effects of income redistribution permits the outlays required to increase capital inputs. Limitations on the ability to use capital due to institutional and other nonmarket phenomena will be unaffected by price programs and will continue to exert an influence on regional competitive relations which is independent of government support activities.

The notion of shifts in regional competitive structures must incorporate all of these items. As previously noted, the realizable input-output combinations prevailing in a region at any point in time are affected by a wide variety of circumstances including tenure relations, past accumulation of capital, accumulated knowledge and management skill, and the prevailing institutional framework. In a sense, some groups get "stuck" and are prevented or hindered in further change. The rate at which cotton producers in Southeastern states can adopt new technologies is strongly conditioned by institutional arrangements developed in that area prior to the discovery of many of the new techniques now available. Existence of a perpetually large surplus of labor, severe capital shortages and small units of production, all of which result largely from the "accident" of history, has a stifling effect on farm adjustments and places severe bounds on the rate at which new methods can be adopted. In other cases, the prevailing institutional arrangements and other noneconomic factors may create a favorable atmosphere for development.

Both the length of the time period involved and regional differences in the rate at which cost-reducing techniques can be adopted are important in determining the effect of price programs on regional competitive positions. Small differences in adoption rates can cause wide adjustments in final position, provided sufficient time is allowed to elapse.

V

Conclusion: This paper has attempted to set forth certain hypotheses concerning the impact that price programs have on interregional com-

petition. It is not exhaustive but does suggest certain conclusions that warrant final emphasis. These can be summarized briefly. Since the adoption of cost-reducing techniques is closely associated with the ability of farmers to acquire more capital, the income and asset redistribution aspects of support programs have important policy implications. Price programs influence asset accumulation rates by creating income transfers both within agriculture and between agriculture and other groups in society. The patterns that these income transfers take will depend both on the level at which prices are set and differences in the ability of farmers to make output adjustments designed to take advantage of price relationships and offset the effect of acreage restrictions. The permanency of these adjustments will depend on the extent to which they are associated with the adoption of cost-reducing techniques and the extent to which they involve committing long-term specialized inputs that tend to fix the enterprise organization that has been adopted. The welfare implications of these adjustments must be viewed in the light of potential benefits to other segments of the economy through the causal effect that price programs have in permanently lowering production costs and in turn the general level of food prices. These gains must be related to the income transfers brought about during the time programs are in effect. A second welfare consideration arises from the fact that some farmers may obtain a permanent advantage while others are permanently disadvantaged, with the result that a realignment of income levels is created within agriculture.

INTERREGIONAL COMPETITION AS AFFECTED BY RECENT DEVELOPMENTS

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MOST interregional competition today in marketing or producing agriculture and livestock products is true competition. Economic factors, from cost of physical production to marketing or distribution of the products, are dominant—perhaps more so than in any period in the last half-century—at least in the past 25 years. There are general exceptions such as various parity and subsidy programs affecting production, marketing and prices of specific products. These exceptions are admitted. However, despite numerous exceptions, there is a minimum of special favors such as transportation rates favoring one region, state or area over another.

Actually, one of the rather healthy signs and trends is interregional complementary development in production and marketing with greater interregional dependence rather than competition.

Just a few years ago competition among regions or states in the marketing of agricultural products was such that numerous barriers to trade were established by action of legislators or by administrators acting under more or less general legislative mandates. Many such regulations were thinly disguised as protection against transmission of diseases and pests. Certainly, there has never been basic argument against protection from disease or insects—there is always an argument against trade barriers and fences, and against the attempt to "fence off" or to fortify a particular market territory. This problem of "fortification" is not confined to agriculture nor to international trade. In fact, in this nation we have constantly fought against such practices. Most such barriers are becoming decreasingly significant in our economic pattern. Other more true competition based on economic factors has appeared.

"Change" is the one factor that can be listed as a constant in our national and regional economics today. Most of us—somewhat familiar with the usual statistical data on finance, employment, agriculture production, and trade—discover with increasing frequency the changes that are taking place around us. These changes are not so readily noticeable on a national basis, but are very significant on smaller regional or area bases. Changes in patterns of adjacent regions or areas are relatively greater. For example, one little item, that of the shift in the growing of strawberry plants in the so-called Western Region has little impact on East

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vs. West regional patterns on growing strawberry plants. It has no immediate effect on Louisiana or other important areas. But it is important within the Northwest.

In the Caldwell area of the Boise Valley in Idaho, a major portion of the strawberry plants are now produced for the Washington-Oregon-California growers. The proper climate, controlled water supply, and new varieties are all of importance. However, in the Boise Valley, it seems that the mother strawberry plant (new varieties, flavor—not just water) will produce up to 28 baby plants, three to four times the number of plants produced in other areas by the same type of mother plant. This is possibly a minor factor in the cost of berries as placed on the fresh or frozen market. It has an impact on production and costs in the Pacific Northwest. It has an indirect impact on interregional competition in quick-frozen berries.

To illustrate further: to what is a very minor crop in that same area in Idaho, *baby lima bean production* to three and one-half tons per acre is almost double that of the Mid-Atlantic States centered in Delaware. It means a shift in the production of quick-frozen products to the area of lower unit cost. It means Idaho vs. Delaware as a source of a major portion of quick-frozen products for national distribution. These are relatively small items in the national pattern. But, they are significant to specific areas. They also illustrate a particular point of concern to the agricultural economist. The total cost per unit of quality products delivered within a region or in national competition means further search for just such a climate, or a combination of well-known factors and their relative importance.

Major Factors Affecting Interregional Competition

No definition of a region has been superimposed on this forum. We are free, then, to adopt our own definitions and boundaries. The Pacific Coast, Intermountain, and Rocky Mountain regions, for example, are three segments of the so-called Western Region of the eleven Western states.

Among the factors affecting interregional competition might be listed the following: (1) changes in food habits affecting production and trade among regions, and (2) changes in economic patterns of areas and regions indirectly affecting agricultural production and distribution of agricultural goods.

These factors are equally important. To illustrate from a field outside agriculture: Salt production from the San Francisco bay area historically sufficient for Pacific Coast markets is no longer equal to demand. First, because of increased industrial demand, and secondly, because the higher or greater use of the land. Land previously devoted to salt-evaporating

ponds is now utilized and needed for location of industrial establishments. This means a shift from San Francisco to Salt Lake—from Northern California to the Intermountain Region—as a source of industrial salt for the chemical industries of the Pacific Northwest.

There are numerous illustrations from agriculture. At least in areas of the arid west where water is "gold." Industrial demand is in some instances sufficient to permit higher prices for water for industrial use than would be possible for agricultural use. Of greater significance is culinary demand for water for residential areas constructed in general agricultural or fruit-growing areas, especially desirable for residential development. This is well illustrated in the San Jose area. It is of special importance as affecting production of apricots. Other areas in California, or possibly areas in Washington and Utah (the only other commercial apricot states) may be able to increase or develop further production of this fruit.

Interregional Changes Affected by Food or Eating Habits

To a great extent, we recognize that the "soil bank program" is most directly associated with the larger tonnage crops. These, historically, are crops in which we have had significant exports—in tonnage of wheat, cotton and tobacco, or indirectly corn, and percentage of production exported of rice and probably peanuts. Although these are crops produced in a number of regions, the greatest concentration is in specific regions where the soil bank will have much greater implications on the total economy of those areas or regions.

A second factor of importance as applied to these crops is that they are the ones perhaps most greatly affected by the utilization of mechanical equipment.

A third factor is that these are the crops in which total consumption in the United States has remained relatively constant. Per capita consumption, at least as applied to wheat and cotton, has been decreasing. These generalizations do not apply to all crops eligible under the soil bank program.

Of perhaps greater importance are the changes in consumer habits which have been apparent over the years and even decades, but which constantly surprise us. So nearly as can be determined, from various groups of statistical data including those from the Bureau of Agricultural Economics, the per capita consumption of agricultural goods—mostly food—has remained constant for some 50 years. This is in terms of weight at the retail level and includes wheat flour, potatoes, meat, vegetables, and all such items. However, if we tie per capita consumption of agricultural products to the total tons as removed from the farm,

we find an increase in per capita consumption of some 25 per cent within the past 50 years. But, while per capita consumption of agricultural products at the retail level has remained constant, consumption of other goods that originate in minerals from the soil through an increasing number of processing operations has increased by two and one-half times.

Changes in Per Capita Food Demand

Changes in the food habits of the nation are rather significant as affecting specific producing areas. For example, total consumption of potatoes is approximately the same as it was 50 years ago. Per capita consumption has decreased by 50 per cent. There is no particular reason, however, why we should assume per capita consumption should decrease further. In fact, per capita potato consumption might increase, because of the use of supplemental products such as potato flour, starch, and the numerous types of quick-frozen products. Production of quick-frozen products for the 1955 crop was double that of 1954 in Idaho. This is important: production of supplemental products is expanding in major potato-growing areas where companies with national distribution are concentrating their production or purchases. Idaho, at least, should increase its interregional trade with all areas of the country. There perhaps is no reason to assume that per capita consumption of apples will increase. It seems that citrus fruits, and certainly the frozen citrus juices, will continue to replace not only apples, but other fresh fruits. Home economists will probably help further to increase per capita consumption of vegetables, but mostly frozen vegetables.

Population Change

Admittedly, there are many differences in per capita or total demand for food and agricultural products among regions of the nation. But, the differences are tending to disappear. Certainly per capita consumption of beef has increased in the South due to local production, income per family, and availability. Certainly the Midwesterner has not yet been "educated" to eat lamb. But, despite these differences, population trends are the most important single factors as affecting interregional trade. This item needs no great elaboration. But, the latest available data indicate that the population of the eleven Western states (including at least three subregions) has increased by 21 per cent from 1950 to August 1956. The 37 Eastern states have increased 7.5 per cent for an over-all national average of 11 per cent. To a great extent, the movement to the Pacific Coast states has been accelerated over the increase during the war period.

To restate: population of seven of the eleven Western states is increas-

ing today above the national average, while only one-fourth of the states east of the Western Region are increasing above the national average. Part of the impact of this is well illustrated in trade patterns. The eleven Western states, classified frequently as a region, are practically importers of beef. On a pound or ton basis, the eleven Western states are not self-sufficient in meat production. The surplus from the West is in agricultural products, not livestock products. Within the subregions of the West, such as the Mountain States Region, there is a surplus production of beef, but shipments are increasingly to the Pacific Coast states. The cowboy is not a relic of the past, but the product he drives around the area is marketed to the West and not to the East.

State and regional totals of population shifts, although of major importance, are perhaps of less significance than that in areas of states. In areas adjacent to major industrial developments, such as steel in Utah, multitudes of industries in the Los Angeles, San Francisco and San Jose areas, or in Phoenix and Denver in the West, of areas adjacent to Houston and Dallas in Texas, in central Ohio, points in West Virginia and New Jersey to note a few population increases, are simply crowding out farm production. In many such areas the "marginal farm" has become a "gentleman's estate."

Trends in Specific Industries

Changes in eating habits, more red meat for example, have had interesting impacts on various livestock industries. But, from a trade pattern, the following are of most significance:

Beef

Possibly the greatest single factor affecting beef is the trend in production in the South. Nationally, cattle and calves on farms have increased by 15 per cent in the past ten years. The increase has been in beef, not in dairy animals. The South Atlantic states show a 25 per cent increase: Florida 25, South Carolina 44, Georgia 32, Alabama 28. Florida has more cattle than any one of the Intermountain states. These states no longer require beef in significant quantities from the Midwest areas. On the other hand, increase in production in the West in the past ten years has been 21 per cent as against a population increase of 21 per cent. One impact is that the price of cattle at the Ogden and other western stock yards is no longer at a differential below Chicago and Omaha. Some 20 years ago, livestock interests in the Denver area were attempting to find markets on the West Coast for feeders as well as fat animals. But, for all intents and purposes, the only cattle at that time moving from the Denver area to the Coast were worn-out dairy bulls for the Los Angeles

hamburger market. Midwesterners moving to Pacific Coast points brought with them a desire for top quality beef. They wanted not only quantity, but quality. We have a new generation in California that has now become acquainted with "good eating." This has meant feed lots in the Los Angeles area and feeders and fat animals from the Intermountain Region, the Rocky Mountain Region, and from the Midwest. On a quantity basis, Florida has become an exporter of beef although leading hotels in Miami want and serve "Kansas City" corn-fed steak.

Patterns in livestock slaughter have, to a great extent, shifted with population but have been influenced by cattle growing and feed-lot operations. Florida is again a classic example. Within the past five years beef slaughter in that state has increased twice as fast as has the population. Slaughter in Louisiana, Arkansas and Mississippi has more than doubled as has also consumption of beef.

Interregional competition from the South is noticeable in production in slaughter of beef. To a great extent, this is also a new market for locally-produced items. In the West the Intermountain and Rocky Mountain regions complement the Pacific Coast. Their products compete, principally in California, with feeders and fat animals produced in California. Competition of these regions for Eastern markets has almost disappeared.

Hogs

Production of hogs in the regions west of the Corn Belt seems almost to have disappeared. There has been some upsurge in recent years, but this industry will perhaps never reclaim its former position. The biggest quantity livestock movement is from the Midwest to the Western States. This means hogs from Iowa, Nebraska and neighboring states move to the West Coast and Intermountain Region. It also means shipment of dressed pork and of pork products by truck and rail. Corn acreage is certainly on the increase in irrigated lands of the West, but in the immediate future will not be adequate to even satisfy the demand for feed for beef.

Certainly, despite the season-to-season substitution of one red meat for another, the long-time trend in favor of beef in the family diet is of considerably greater importance as affecting places of production and trade. To some extent, because of the dislike for chores, hogs as a minor part of the family farm operations have tended to disappear. This is especially noticeable in the West. There is minor competition between hogs produced locally and those shipped from the Midwest. Iowa, on the other hand, with all of that state's natural and developed advantages in hog production and slaughter, and also, Nebraska, to a lesser extent,

with its similar advantages, are becoming relatively more important due in part to West Coast demand. This is in part complemental development.

Lambs

The decrease in lamb production is found in most parts of the nation. For producers of the eleven Western states, plus Texas, the major hope for the industry would be to transport those from the West Coast, or the East Coast, to the beef-hog producing areas. There the newcomers might have an influence on eating habits similar to that effected in California on beef.

A rather interesting trend, however, is the increased lamb slaughter nearer the producing areas of the West for shipment as dressed meat to Eastern markets. This is noticeable especially in Colorado, Utah and California. There are other noticeable trends: (a) earlier lamb production in Idaho, (b) shipments of lambs to California from the Intermountain Region in late fall, and (c) shipment of dressed lamb east to Midwest and Atlantic Coast areas. Competition is dressed California and Idaho lamb vs. Pennsylvania and Ohio lamb for East Coast markets. The time when California could market 16 brands of eggs in New York City, or Utah could sell its famous "Milk White Eggs" on the New York market has long since passed. Market areas have become smaller and much of the production in rapidly-growing industrial areas is decreasing. There are a number of reasons: part-time operations of poultry plants is disappearing. As a result, egg production and broiler production have failed to increase in areas where employment in industry off the farm is available. Industrial jobs are of more importance. The Utah egg market has rather suddenly contracted to include not much more than the state boundaries. Colorado and Arizona have increased demand for eggs from the Midwest. Broilers are now moving from Texas, Arkansas and the Midwest to the Intermountain and Pacific Coast markets. There are two apparent basic factors: industrial jobs and increased size of successful poultry operations. Poultry and egg production from small farm flocks has all but disappeared. Specialized production away from industrial areas is of growing importance. There seems to be evidence that broiler production is at lowest cost with 10,000 to 20,000 broilers, not per season but for each 6- to 8-week production. Egg production begins, it seems, with a flock well above 10,000 hens.

Dairy products

Some Western states have a limited surplus of dairy products. This includes the total of market milk, dried and powdered milk, cheese and butter. Idaho, today, is the only major surplus state in the West in its

total production-consumption of dairy products. There are, of course, surplus areas within the states. Shipment of fluid milk from one milkshed to another still is under serious handicaps through local regulations or barriers.

Los Angeles is one of the interesting cases. Dairying even on a feed-lot (no-pasture) basis cannot compete with residential development. The market is such that almost all milk production in that area is now Grade A. Another point is the increasing utilization in that area of a dairy cow as a "machine." As a result, in much of Southern California, dairy calves are marketed as veal. This means an increasing number of mature cows and heifers from the Intermountain Region are marketed to dairies in California. The competition between Intermountain and West Coast is for dairy cows produced in the Intermountain Region. Of course, there is also competition as among dairy products (cheese, butter, etc.) among producers in the dairy belts, the Intermountain Region and the West Coast for the West Coast market.

Agricultural Products

Interregional competition has a number of significant characteristics mostly associated with specific agricultural products. A few are illustrated below.

Potatoes

Some rather significant changes are noticed in winter, spring and summer potato production because of the housewive's insistence on purchasing high-quality potatoes in small quantities. Of the big states, Idaho and Maine now far outstrip other rivals for total and for fall production. Despite percentage increases in freight rates, the Idaho potato has widened its market considerably, and Maine "Russets" are not "Idaho bakers." A new factor is the increase in quick-frozen potato products.

As noted earlier, one-fourth of Idaho's production in 1955 of 50 million bushels was diverted into potato products. Production is sufficiently large to warrant increase in size of these potato-processing plants for a national market under well-known trade brands. This means an increasing per cent of potatoes utilized in the home are coming from more distant places—from areas or regions with adequate supply and uniform quality. New Jersey and Long Island cannot well produce potatoes on the sandy land devoted to industrial plants and residential areas.

Other crops

In other items, a few comments must suffice. Specialized vegetable-producing areas are associated closely with quick-frozen products where quality soil, climate, and water are significant. This applies to such prod-

ucts as baby lima beans for quick freezing, spinach and even to a limited extent to the larger quantity products such as peas, beans and corn. This means production in more limited areas—a great increase in interregional trade.

Citrus fruits

The intense historical California-Florida competition in oranges has, on a quantity basis, been won by Florida. This applies especially to the "juice" portion of the industry. Few would insist the competition has been quality. But Los Angeles, Orange, and neighboring counties cannot grow oranges and dwelling units on the same property. Florida's production is not from Miami or Palm Beach areas. Citrus fruit production has all but disappeared from the Phoenix area in Arizona. Competition is for land and water as among citrus production, dwelling units, and industrial plants. To a lesser extent apricot, olive and walnut production in California are affected by residential and industrial competition for land. Extend a freeway into a citrus, walnut or apricot area and the trees are uprooted for residential units. Although many trees remain, production in such areas ceases to be commercial. To a small extent, this pattern is noted in fruit areas now becoming residential areas in Utah.

Industrial Development

Industrial development affects both production of and demand for agricultural products and, likewise, the trade in those products. In many areas in California, certainly in Central Utah and the Phoenix areas, agricultural production is losing out to industries, first because of establishing industrial plants and/or residential areas in orchards and in farm land. Secondly, because part-time farming is proving less successful than anticipated. Certainly, as a result, Florida has become the biggest source of frozen citrus juice—citrus groves have all but disappeared from Arizona. The Midwest, Texas and Arkansas are becoming sources of livestock products for the Pacific Coast States. So-called surplus production of dairy products from the Intermountain Region, at least translated in terms of canned and powdered milk, is moving increasingly to the Pacific Coast. A trend, beginning some 30 years ago, has been accelerated in recent years. This is the purchase of dairy cows from the Intermountain Region by Southern California dairies. Dairies in California areas cannot afford to raise their own dairy animals. It is strictly a question of economics, that of constantly bringing in mature animals.

To repeat, or to summarize, regions that were formerly competing with each other for distant markets (beef, chickens, poultry products, milk

products as examples) are now complementing each other. This applies especially to Western regions—the Pacific Coast, Intermountain, and Rocky Mountain regions which market few livestock products to the East and Middlewest. Turkeys and lambs are exceptions. Competition between agriculture and industry for the use of land, competition of industrial job opportunities with part-time farming, especially in irrigated areas of the West, means Western states are becoming increasingly markets for livestock products of the Midwest.

Increases in freight rates have, to some extent, caused producers of agricultural products to look elsewhere for markets. But, this is less significant than possibly expected.

The new I.C.C. order that became effective September 1st will tend to reduce class rates in the West by some 25 per cent. It means almost uniform classification and freight rates (mileage basis) on products moving throughout the nation on class rates. Classifications previously applied to rail traffic east of Denver will have been established in Mountain-Pacific territory. This change will have small impact on trade within the eleven Western states. It will have only minor impact on the movement of agricultural products that move on commodity rates. It will have significant impact on movement of industrial goods. The most important effect, then, will be some shifting of industrial production. The results will be indirect on agriculture.

Labor and jobs

As noted earlier and as recognized as a perennial problem, farming areas are overpopulated. Mechanization, larger farms have reduced demand for labor. Despite mobility of labor, there are inertia, social relationships that "pull" against movement from farms to cities, to other regions.

There is increased industrialization in larger cities in the "farm belt" and manufacturing is not confined to agriculture products. There are, however, the thousands of small farm-marketing centers in which no industrial development has, or will, take place. These areas have surplus labor from the towns or surrounding farms. Nearby farms, in many instances, are marginal and comprise problem areas.

Efforts of industrial development committees of local chambers of commerce in such agricultural communities have had some success. The successful ones have been widely publicized. More success is needed. In some instances local sources of minerals have been developed. In others water, labor force, transportation facilities are factors leading to establishment of plants not oriented to sources of raw materials or to markets. but to other factors.

Industrialization and Agricultural Economics

The new developments in electronics, in chemistry with intense demand for skilled labor is, today, perhaps the most important factor in agricultural economics. These developments affect demand for labor, for agricultural products, farm values and types of products. Agricultural land near industry is most directly affected. Patterns of competition as among areas and regions are vitally affected. As a result, complementary production and marketing of agricultural goods as among regions is of increasing significance. Industrial development in apricot or orange groves in California is of vital importance in creating markets for agricultural and livestock products from other areas to California. The same general effect is apparent in other areas: in Central Utah, in Phoenix, in Denver, in areas in the South, and in Ohio. Today, then, the multiple effects of industrial growth in specific areas or regions, changes in agricultural patterns in a number of areas and regions are bases for a considerable amount of the problems of agricultural economics.

DISCUSSION: THE EFFECTS OF INDUSTRIAL DEVELOPMENT ON TENNESSEE VALLEY AGRICULTURE, 1900-1950

JOHN D. BLACK
Harvard University

At the outset, I wish to make clear that I have no objections to Professor Nicholls' analytical procedures nor to the detailed findings from his analysis. Moreover, I find nothing startling in them—they are what I would expect.

My interest in this paper is mainly in its broader aspects—what it signifies for the development of backward rural areas elsewhere, including around the world. And I am warning you at the outset that I am going to challenge somewhat Nicholls' concluding statement that *only* "through continuing industrial development of low-income rural areas—can the problem of the Southern region finally be overcome." Also, before his conclusions are given too wide application to other low-income areas, attention should be called to some features peculiar to the region studied or to parts of it:

(1) First of all, especially back in 1900, most of the region is or was an area of highly diversified farming. When I first came to this region in 1937, in connection with an analysis for the T.V.A. of its test-demonstration farm program, I came to realize fully for the first time that diversification of enterprises on the individual farm is in itself no guarantee of an

adequate income. Here in this northeast Tennessee area, nearly all of the farms were producing for sale some combination of most of the following: tobacco, wheat, beef, pork, dairy products, and poultry. And yet their incomes were relatively low. The main reason for this was, of course, that they had small acreages of cropland and pasture per farm.

Most of the low-income area of other parts of the South, in contrast, is rather highly specialized in cotton or tobacco or the like. This also tends to be true of most of the low-income area in other parts of the world that I have studied in recent years—in India, for example.

Probably some parts of the East Tennessee area, however, particularly the more mountainous parts of it, are best described as subsistence farming areas, or close to this. As such these do fit other mountainous parts of the South, and similar areas in other counties.

(2) The second feature peculiar to part of this area is the way in which a specialized cash crop of high labor intensity, burley tobacco, has spread out over it in recent years. This, as Nicholls has pointed out, has considerably distorted the normal course of adjustment of agriculture to industrialization in various parts of the area.

What I miss most in Professor Nicholls' paper is more specific description of the adjustments in farming that took place on the farms in the countries industrializing, in contrast with those not doing so. I presume that some farms were combined with others as families shifted to industry and trade; but to what extent? What happened to number of farms and size? The shift to livestock farming came about by producing more feed? By improving pasture? Or how? Nicholls mentions the increase in part-time and residential farms. What has become of the land formerly farmed on these farms? In Worcester County, Massachusetts, in which we at Harvard have been studying changes in farming along with increasing urbanization since 1937, the remaining commercial farms have absorbed about half of the commercial or part-time farms that have disappeared, and on the others the land has largely gone out of farming use.

I would also like to know more about the forms in which the increased income has arisen. Feeding feed to livestock in place of selling it for cash does, of course, increase income—it puts the feed through a follow-up production process. But in addition to this, was more feed produced by planting more acres or by increasing yields, or how?

Now let us turn to Nicholls' final statement that only by industrialization can the low-income problem of the South be solved. I shall first affirm that there can be sometime an agriculture in the South that averages as high an income per family as will be attained in the Corn Belt in the same years. All that will be necessary for this will be for the

average farmer to be farming enough land to give him command of an equal productive capacity. He can get this in two ways, by building up the productivity of his present land and any that he acquires, and by acquiring more acres. It is the second of these that displaces the labor, except as there will probably need to be a mechanization that goes along with both that displaces still more labor.

What is to become of this displaced labor? Surely it must find occupation somewhere. It need not be in the same community, nor in the same county, nor even in the same region. Neither must it be in industry. The industrial component of our occupation mix is declining along with the agricultural component, although not so drastically.

A related major aspect of the answer to the question asked is that by no means are all subareas in a region well located for industry. Their comparative advantage in production of farm products *vs.* industrial products is such that they need to remain agricultural with little or no industry and only such trade and servicing as an agricultural area needs. Does this mean that they must have low incomes? They can be just as prosperous as those that industrialize.

This in the case of Russell County, Virginia. It does need to enlarge its beef cattle farms, and this alone can raise farm incomes in the county to a level comparable with the nonfarm earned incomes roundabout. Conditions will be better, of course, if at the same time the pastures and herds are improved and better managed. Similar adjustments, but more drastic ones, will raise to equality of income other areas with much more limited per-acre agricultural resources than Russell County—even the counties more nearly self-sufficing now—*with little or no industrialization.*

But, of course, what Nicholls really means to say is altogether true, that movement off the farms of much of the population of low-resource counties is altogether necessary if the future people of these counties are to have good incomes. The other locations and occupations to which they had best shift is another matter, and one with which the paper under discussion does not really deal.

Finally, however, in spite of my questions, I am in full agreement with the major import of Professor Nicholls' findings, namely, that the areas in which local manufacturing industries have comparative advantage are particularly fortunate. These will be the ones in which progress toward larger incomes will be easiest and fastest. They are the ones in which the rankings have risen most in the East Tennessee area.

DISCUSSION: PRICE SUPPORT PROGRAMS AND INTERREGIONAL COMPETITION

JOHN L. FISHER
University of Nevada

My only disappointment in Sorenson's paper is that I want empirical data upon which to base conclusions. If the topic had been assigned five years ago, maybe he would have fulfilled my hopes today! Those of us who deal with policy problems in the Intermountain area of the West know that this topic is very important. We need answers today. Our cattlemen are asking if *the* cause of present depressed cattle prices is not supported basic commodities. Ranchers ask if the great expansion in cow numbers in the southeast means a long perpetuation of current low cattle prices. This expansion is believed to be "price-support induced." I recognize that I may be doing something that Galbraith in the August *Journal*[1] accused many of us of doing (and rightfully so). That is, failing to fit my thinking into the other "stock" policy categories, I advocate more research! Seriously, I am frequently embarrassed by my own inadequate answers to ranchers' questions concerning the competitive effects of the present support program.

One of the significant changes shown by the 1954 Agricultural Census was proof that agriculture has continued its accelerated rate of increasing specialization. Farmers are buying more of their factors of production; fewer farms are producing greater quantities of products. The higher the degree of specialization in agriculture, the greater will be the implications of price support programs upon interregional competition. The topic of discussion here today will become increasingly more important.

From this point of my discussion foreword, I would like to accept the logic of Sorenson's theoretical framework of *how* price supports influence interregional competition. However, from a realistic viewpoint, the total research job needed to fill the framework with empirical data will not likely be accomplished in a single project. We will move ahead piecemeal. I would like to call attention to those places I believe need investigation the worst.

I am not convinced there is serious conflict between regions on the basis of market substitution of product resulting from price supports. Those who claim there is may be letting the "tail wag the dog." Changes in income, greater knowledge of nutrition, and different diets have played havoc with certain products, such as the starchy foods. In too many cases, I feel we economists have carried our analysis back *only*

[1] J. K. Galbraith, review of book by Murray R. Benedict, *Can We Solve the Farm Problem?*, *Journal of Farm Economics*, August 1956, pp. 878-882.

to the price support program, calling it the *cause* of consumers substituting one product for another. With highly inelastic demand for the supported commodities, I suspect we must blame other than price supports for much of the substitution of product in the market place. On this particular score, I question that price supports have either increased or decreased regional competition very much. Conflict arises among regions *after* substitution, no matter what its cause may be, creates a high cost to government via the support program.

Farmers and ranchers see regional competition quickest when quotas restrict the acreage used for growing supported commodities, and in so doing release acreage which goes into production of unsupported commodities. Even after 10 years of expanded marketing research and extension work, farmers still see changes in supply much more quickly and more readily understand its significance than changes in demand. For example, at the present time western cattlemen clearly see southeastern competition. They view cotton supports in the southeast and corn supports in the corn belt as an opportunity for competitors to build an almost "costless" cattle production "machine." If demands for supported products are inelastic, then reduced acreages maintain per farm income above what it would otherwise be, *and* acres are released at the same time. Even with use restricted to soil conservation or rebuilding, increased fertility may reduce per unit costs to where an unsupported commodity becomes an economic alternative.

Now let us turn to the argument that price support programs have *caused* regional shifts in production which have led to increased regional competition within the confines of a given commodity market. An illustrative development is the growth of the western cotton industry, even our Pahrump Valley in Nevada! Few would argue that this development was not affected by price supports; but I suspect most such developments are less dependent upon supported prices than is commonly believed. What an area produces is dependent upon the alternatives faced within the area. In the case of the Pahrump Valley, I believe the valley would have been developed *with or without* price supported cotton. A review of the logical alternatives indicates that cotton may have been grown even at drastically lowered prices. Even in pre-price support days new areas *did* come into production, and in some areas the number of producers of a product increased amid an over-all trend toward greater specialization of production in those areas of highest comparative advantage. In recent years whenever this happens there is a tendency to attribute the whole thing to price supports. Occasionally I feel we confuse *association* between price support programs and market or production structural changes with *causes* of the structural changes. Expanded

output per firm in the specialist areas for supported commodities is frequently attributed to price supports, yet output per firm in the specialist areas of nonsupported products has also increased. Broilers and tomatoes are good examples. I feel that in our policy work we have frequently used price supports as a scape-goat to cover up our own analytical shortcomings.

Traditionally we have analyzed price support programs in some historical manner. If these analyses are to be of much value as stepping stones in analyzing interregional competition we must also synthesize what conditions would have been without price supports, with differing levels of price supports, and with price supports administered so as to achieve various objectives. For example, I can reason that in our specialized market economy price supports at the long-run stability level could lead to nearer optimum regional allocation of productive resources, but supports above the level could lead to mal-allocation. For an even more realistic example, in answering our western cattlemen who are worried about southeastern competition, we should ask ourselves whether or not it is possible that without cotton supports the beef to cotton alternative ratio might have been even higher and the southeast therefore have gone to beef even sooner. With this as a possibility, cotton price supports and their regional competitive implications might not "look" nearly so bad! I suspect the same appraisal applied to other commodities would lead to similar conclusions.

DISCUSSION: INTERREGIONAL COMPETITION AS AFFECTED BY RECENT DEVELOPMENTS

WILLIAM E. FOLZ
University of Idaho

I can well believe that Dr. Nelson believes in his statement, "Change is the one factor that can be listed as a constant . . ."; he changed his paper since I saw it. In the first version of his paper Nelson stated in the introduction that his assignment was so broad that it may as well have been titled "The Universe and Other Things." From what I am about to say by way of criticism he may well complain that I have criticized him for not sticking to the discussion of the Universe. What I am about to say is not so much a criticism (for I cannot find much to quarrel about in any of his positive statements) but rather a disappointment over what he did not treat in his paper.

It seems to me rather pointless to discuss regional trade unless we are going to evaluate it as it affects the utility function of the region or of

the country as a whole. We may well take our cue from the early economists who were interested in the theory of international trade to secure answers to two very pertinent questions, both of which had important implications for material policy discussions. The first question the classical economist raised was "Under conditions of free trade what would each country tend to produce?" They found the answer to this question in the famous law of comparative costs. The second question was "What are the gains from trade?" Although the answer to this question is not easily summarized, there did develop around it a rich literature which, it seems to me, could be used profitably in our current discussions of interregional trade.

Recently the analysis of gains from trade has centered around the concept of complementarity of international trade. Trade is said to be complementary if it results in an increase in the utility of commodities already produced in a country. For example, a country producing cars, to use Mr. Mayer's illustration, will increase the utility of its cars if its imports petrol. On the other hand, if the country produces black cars and imports blue cars, the utility of the black cars will be decreased as a result of the opening of trade.[1] In this example, petrol is complementary, blue cars are competitive. It is generally conceded that trade that is complementary increases total utility in a country, whereas trade that is competitive, if it does not decrease total utility, at least does not increase it as much as trade that is complementary. It would seem that a discussion of interregional trade in which interregional competition is a part of the title would inevitably involve us in a discussion of complementarity of trade.

Nelson did discuss comparative advantages to some extent in his paper, but it seems to me that he stopped short of arriving at any conclusions that would add anything new to this subject. The two factors he lists as being dominant in causing changes in the location of industry present nothing new. They can be summarized as factors affecting demand and factors affecting supply. Except for the statements to the effect that demand is being greatly influenced by population increase and by intensified industrialization in the West and that supply is being affected by alternative uses of land resources and by utilization of superior land resources, little was done in the paper to explain changes in location and changes in trends of economic activity.

That agriculture in the West is becoming less competitive with that of other sections of the country is a generalization of little significance unless it is considerably amplified. Does Nelson mean to imply that the

[1] F. V. Meyer, "Complementarity and the Lowering of Tariffs," *American Economic Review*, June 1956.

West because of its rapid growth in population and industry is becoming on balance a market for farm products of other parts of the country instead of a competing producing area as it was in the past? If this is true how does he account for this type of development in the West? To what extent has the development of the West departed from the pattern of development of other sections of the country? Has not the normal pattern of regional development been for agricultural production in the first instance to be concentrated in commodities highly competitive with agricultural products grown in other sections of the country and later after further economic expansion had occurred, become less cooperative? None of these interesting questions are treated in Nelson's paper.

As we pursue these questions we find that we cannot discuss interregional competition intelligently without probing into the companion issue of complementarity of regional trade. Nelson seems to imply although he does not specifically state it that trade becomes complementary when a region develops to a point when raw materials are no longer produced for export from the region. He states that "regions formerly competing are now complementing each other." In no place in the paper, however, does he discuss complementarity.

There can be no doubt that as intraregional balances of trade develop, especially in commodities of surplus production such as foods, disruptions caused by interregional competition are avoided. It is much easier to demonstrate to skeptics in the East the value to them of the economic expansion of the West, if it can be demonstrated that such an expansion increases the marginal efficiency of capital throughout the country and at the same time offers little or no competition to economic activity already located in other sections. But such an argument depends on assumptions that are not axiomatic.

There would seem to be a strong basis for the assumption that as a region develops commercially it would tend to become more complementary and less competitive in its trade with the rest of the country. Competitive commodities are more likely to be those which have inelastic demands. These commodities would be for the most part food products and raw materials. As a region becomes economically more mature it would tend to consume its own food products and to process its raw materials into finished products. Trade in these manufactured products would presume a high degree of complementarity. These commodities would be less likely to lower the utility of commodities produced in other sections of the country, and the total utility will be increased because of the change in the nature of the trade. I have taken this position in the past and for all practical purposes I still adhere to it.

It would be possible, however, to conceive of situations in which a

regional economy as it matures becomes less rather than more complementary. It may cease exporting raw materials that are complementary to the industry of the remainder of the country and that increase the marginal efficiency of capital in the rest of the country, and start exporting manufactured products in which the region has developed a comparative advantage but is highly competitive with manufacturers already established in the rest of the country. As a result the new position of trade may decrease rather than increase total utility. The industrialization of Germany and America in the nineteenth century was competitive rather than complementary to England. The industrialization of the South has been more competitive than complementary to New England.

I do not believe that the economic expansion of the West has resulted in trade that has become less complementary. There is strong evidence to the contrary. The rest of the country has excess savings and consequently all trade tends to be complementary.[2] There is also evidence that oligopoly is more prevalent in manufactures than in raw materials. Even in types of industry, where comparative advantage would seem to be decidedly in favor of the West, such as the development of processing of aluminum products, the fact that the industries are firmly established in the East and that they are economically strong has prevented them from being established in the West in competition.[3]

The analysis of competition and of complementarity of trade has its limitations but it does offer a rather fruitful field of inquiry into the important matter of gains for trade. It can be useful in bringing to the fore those attributes of regional expansion that do and those that do not add to the total utility derived from interregional trade. I had hoped that this session would have placed greater emphasis on this issue.

I am afraid that my criticism has been in the direction of telling Dr. Nelson what he should have said in his paper. This, I feel, he can take as a compliment. I found very little to criticize in what he has actually covered in his paper.

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[2] F. V. Meyer, *Op. Cit.*, p. 334.

[3] Edwin J. Cohn, Jr., *Industry in the Pacific Northwest and Location Theory*, Columbia University Press 1954.

AGRICULTURAL POLICY ISSUES

Chairman: C. H. Merchant, University of Maine

ECONOMIC IMPLICATIONS OF CALIFORNIA AGRICULTURAL MARKETING PROGRAMS*

SIDNEY HOOS
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Introduction

"ECONOMIC conditions are constantly changing, and each generation looks at its own problems in its own way." So Alfred Marshall began the "Preface" to the first edition of his *Principles of Economics.* One may wonder why Alfred Marshall is brought into a discussion of agricultural marketing programs, other than to impress some naive listener with a flavor of superficial profundity. But in terms of the basic economic ideas underlying marketing programs, our generation draws heavily upon the system of thought commonly referred to as Marshallian analysis. This is to dispel the notion that marketing programs involve some new, unique, and all-powerful system of economic analysis.

The generic phrase we have used, "marketing programs," includes "marketing agreements" and "marketing orders," which differ in application of regulations but not in economic rationale. There are essential differences between milk marketing controls and those for other commodities. Time does not permit consideration of milk; hence, we limit our discussion to marketing programs for other products. Both federal and state governments have marketing control legislation, and here we must further limit our terrain by considering only California programs, although many of the economic implications are also pertinent to federal programs.

Attributes and Functions of Marketing Programs

Marketing programs were born as a result of problems engendered by the "great depression." But the economic embryo of marketing agreements and orders was gradually and experimentally developed by certain cooperative marketing associations during the 1920's. Their problems and tribulations need not be recited here; yet, those cooperative marketing associations became convinced that their own devices were not fully adequate to achieve the goals envisaged. New legislation and limited government participation were deemed to be essential adjuncts.

When experience with marketing agreements showed that their signees were "holding the umbrella" for the nonsigners, thoughts turned to a device whereby everyone in the industry concerned would be required to support the umbrella. Thus emerged marketing orders with their uniform

* Giannini Foundation Paper No. 158.

and industry-wide application to all producers or handlers of the product concerned. Such industry-wide application of marketing orders has, however, often been misinterpreted. This does not mean that the industry has no choice as to whether an order will be introduced; it does not mean that the industry is powerless to change or even to eliminate the order; nor does it mean that the industry, with its order, can operate only as the industry desires.

Legislation clearly sets forth the procedural and administrative criteria to be followed. The many important details of such procedures need not be discussed here since we are interested only in setting the background for discussing certain economic questions. But several significant points must be underlined. First, a clear and definite majority of the industry must approve an order before it can be effective. Second, the California Director of Agriculture is required to determine whether the available evidence indicates the need for an order and that the proposed order meets that need. Furthermore, the Director has the authority to terminate an order which is in operation if, in his judgment, it is no longer consistent with the legislative standards.

To assist him in operating a marketing order, the Director appoints an advisory board from a list of industry nominations. But the board cannot make decisions and act on all matters of any consequence. The board can only recommend to the Director and he either approves or disapproves.

The general goals of marketing programs are mainly oriented in the direction of improving returns to producers. Although the Director is required to give consideration to consumer interests as well as to those of the industry at large, the legislation is clear that its primary concern is with the economic welfare of producers. This "economic welfare" of producers is measured in terms of "purchasing power" which is suggestive of, but not completely identical with the "parity price" or "parity income" notions embodied in federal legislation. Rather than referring to a specific per cent of some base, the California legislation expresses its objective in terms of purchasing power adequate to keep in business an adequate number of producers providing an adequate supply of the commodity to meet the needs of consumers.

To attain the various objectives embodied in particular marketing programs, a set or battery of provisions and tolls has been developed over the years. Some of these provisions are of the more obvious nature and supplement the type of marketing legislation prevalent in most states as well as in California. Yet, other of the marketing program provisions are unique in that they operate to any extent only because a program is effective. The major provisions or marketing tools, one or more of which are written in the various programs, include: grade and/or size regula-

tion; pack and container regulation; mandatory inspection and/or certification; unfair trade practices; advertising and sales promotion; production, processing and/or marketing research; and volume regulation, with or without stabilization pools and funds.

At this point it is advisable to pause a moment and destroy a false notion which is prevalent in the minds of many persons, including some who have a superficial familiarity with California marketing programs. Too often the unfounded thought is expressed that marketing agreements or orders are synonymous with quantity restriction and that without that provision there would be no programs. Such a view may be a throwback to the early days of programs when quantity regulation was the primary, although not the only, reason marketing controls were initiated. In recent years, however, the situation is drastically different. Quantity control, as such, is incorporated in only 10 of the 28 marketing programs currently in effect under California legislation; but even for those 10 programs, quantity restriction is permitted only with the approval of the Director rather than being mandatory or automatic.

In view of the economic significance and implications of quantity restriction as a part of the marketing programs, however, we shall later consider this topic again. Now, we continue with the other types of provisions. The most prevalent provisions include "sales promotion and advertising" which is embodied in 23 of the programs, and "production or marketing research" which is incorporated in 22 of the programs. "Grade or size" regulation and "inspection or certification" are next in order of frequency. Then comes "quantity regulation," followed by "pack or container" regulation, with the "unfair trade practices" provision the least frequent. Also, one may note that there is no fixed or standard formula setting forth which particular provisions are to be incorporated. Each separate marketing program is tailored to meet the considered needs of the commodity concerned, and there is complete flexibility as to which provisions are excluded or included. Various combinations of marketing tools may be drawn upon in the development of programs. Also, a single commodity may have more than one program in operation simultaneously.

It is important to recognize that neither by legislative criteria nor by administrative procedures need the provisions or operational objectives of marketing programs be static or unchanging over time. As long as the broad general criteria written in the state legislation are met, and the Director makes a finding to that effect, a proposed program or an amendment to an existing program may be approved by him. The various industries having marketing programs have taken advantage of this flexibility. As with a biological organism, the institutional organism of a marketing agreement or order undergoes mutational and evolutionary changes.

As one studies the evolution of marketing programs and surveys their changing objectives and emphasis, one sees a moving picture of institutional development. Each program has its own special existence as does each individual in a population. But the societal group gradually takes on new characteristics as the older ones change emphasis and form. The process of institutional mutation and evolution may with considerable articulation be identified in the history and development of marketing programs. In the early days of marketing programs, their primary provisions pertained to quantity control and regulation which in practice meant volume restriction. Later, provisions for grade and size regulation, mandatory inspection, and certification assumed increased relative importance. And still later, sales promotion and advertising along with the sponsorship of research received relatively increased attention. This does not mean that the older provisions were necessarily dropped as new ones were adopted; rather, it means a change in relative emphasis and balance. The development of marketing programs fits in well with Marshall's "Principle of Continuity": "The new doctrines have supplemented the older, have extended, developed, and sometimes corrected them, and often have given them a different tone by a new distribution of emphasis; but very seldom have subverted them."

One may question how extensively used are the California marketing programs by the state's agricultural industries. Whether the answer is "considerably" or "little" depends upon the yardstick of comparison. Since 1933, some 70 different programs have at one time or another been in operation. A number of the programs were effective for only a single season, and others have operated in some form for as long as 20 years. The average length of life of those 70 programs is about six years, although that figure cannot be actuarially interpreted as an index of life expectancy.

At the end of last year, some 28 different marketing programs were in active operation under the authority of California legislation.[1] These 28 programs reflect an average length of life of nine years, with individual programs ranging from less than a year's duration to as much as two decades of operation. But a figure of 28 programs may not be impressive when compared with a total of over 200 commercial crops and products marketed by the state's agricultural industries. Such comparison, however, may be misleading. A more meaningful set of indicators of the role of marketing orders in the state's agricultural economy may be that in 1955 the total farm value of all commodities having orders amounted to

[1] California Department of Agriculture, *Bulletin*, vol. 65, no. 1, January-March, 1956, also from which other data noted here are drawn.

$390,000,000—15 per cent of the state's total cash receipts from farm marketings or 23 per cent of the cash receipts from crops. Another statistic is that close to 35,000 producers, 33 per cent of the state's farmers, were directly affected by those programs, and a substantially larger number were affected indirectly. These figures are not cited to impress you with the dimension of bigness, a Californian trait of which you must by now be well aware; the intent, rather, is a serious one to place before you in proper perspective and balance the economic position and role of marketing programs.

Economic Implications and Inferences

To finance the 28 marketing programs operating in 1955, the producers and handlers directly concerned with those programs provided all of the necessary funds. This amounted, in 1955, to almost $6,900,000. These expenditures were borne entirely by the industries through assessments on the participating producers and handlers or processors. The term, "self-help," is applied to these types of programs. But it is somewhat misleading. A more appropriate descriptive phrase would be "self-financed," and even this phrase would refer to direct immediate expenditures; for if the programs are successful, over a period of time they presumably yield sufficiently increased returns at least to offset their direct costs to the industries.

The question about the phrase, "self-help," is raised here not only because of clarity in nomenclature. There is also the important issue of joint participation between the state represented by the Director of Agriculture and the industries concerned represented by their respective advisory boards whose function is to assist and advise the Director. The industries presumably initiate the promulgation of the programs; but once such action is taken, from then on the state assumes definite functions and has certain weighty responsibilities. Aside from the matter of direct financial costs, the state is definitely one of the necessary parties. Hence, marketing programs of this type are not the result of industry autoinsemination and self-gestation; rather, such orders result from the institutional cohabitation of the state government and the industries.

To suggest the heavy responsibilities borne by the Director, the following sections from the Agricultural Code (1955), State of California, are cited:

"3183. . . . the director shall not issue such agreement or order for the written assent of producers or handlers unless he finds after public hearing that all of the following are true:

"(a) The supply of the commodity available for marketing exceeds or is likely to exceed the demand therefor at prices which will provide a reasonable return to producers of the commodity.

"(b) The return to producers of the commodity will tend to be increased through the operation of the proposed marketing plan.

"(c) The proposed agreement or order may be administered without permitting unreasonable profits to producers of the commodity and without unreasonably enhancing prices of the commodity to consumers.

"(d) The proposed agreement or order will tend to prevent disorderly marketing of agricultural products within the State.

"(e) The proposed agreement or order will tend to provide consumers with a more stable and adequate supply of agricultural commodities.

"(f) The proposed agreement or order will tend to establish or maintain such relationship between the quantity of the particular agricultural commodity marketed and the demands of the market for the commodity as will tend to continue in production such volume of the commodity as is probable will be needed over a reasonably long period of time to supply the requirements of the commodity and to provide an adequate standard of living to the farm operator and his family."

From those economic standards flow various economic implications and inferences. First, it may be noted that nowhere are the economic standards expressed in precise numerical or quantitative terms. No specific percentages of some sort of "parity price" or "parity income" are directed. The Director is not bound either to a simple or a complicated numerical formula. On the contrary, the legislation imposes upon him a tremendous burden in the exercise of judicious wisdom compounded with economic thought.

In the judgment of what are "reasonable" and "unreasonable" returns to producers, in the determination of "unreasonably enhancing prices–to consumers," in the specification of "such volume as is probable will be needed over a reasonably long period of time," and in the measurement of "an adequate standard of living to the farm operator," the Director is given no guide in the legislation. One must admit with candor, moreover, that the economic science we have at hand can probably help little in such normative classifications, particularly for an economic system that is characterized by growth, change, dynamic structural variations, uncertainties, and the vicissitudes of various degrees of hot and cold wars. Only restraint, supported by naive preconceptions, deters one from suggesting that perhaps the Director might consider supplementing his staff of administrators, economists, and lawyers with a bold and articulate philosopher.

These questions about the Director's responsibilities with respect to volume restriction cannot be dismissed with only cavalier recognition. Although weighted with normative values, the standards certainly involve economic relationships and for that reason alone we must be concerned with the economic implications and inferences. The standards are based in large part, although not entirely, on a conventional static and partial

equilibrium setting where for each of the products the demand functions facing consumers and producers, the short- and long-run supply functions of producers, and the rest of the Marshallian kit of analytical tools, concepts, and functions are known or can be estimated sufficiently accurately to serve as operational devices. Would that we, whether conventional economists or econometricians, could have at hand all of that economic information in usable form so that at any time it could be drawn upon for policy considerations and program decision making!

Yet, some of us might shrink with horror from such a thought. One can already hear shouts of protest. The objections might be for various reasons among which we would likely hear the following: you should use a general equilibrium analysis and not partial equilibrium; you should have a dynamic model which incorporates uncertainty and expectations; you should be concerned with total welfare and not primarily producers; you must use a simultaneous equations approach; you should use activity analysis of production and allocations, or at least linear programming; how are you going to measure welfare and handle interpersonal as well as intertemporal comparisons; and so on. And from one corner, someone might inaudibly mutter, "If you could only get the right isoquant, isorevenue, and isocost maps so you could set up the right Edgeworth-Pareto box diagrams, you could get the equilibrium solutions."

The point I want to make is that, on the premise there are marketing programs with economic standards of the type briefly indicated earlier, the Director or a comparable administrator can obtain from economists only a very limited amount of the economic information compared with what he should have in order to do his job as set forth in the legislation. Yet, one should not be overwhelmed with doubt and pessimism. Economists can and do contribute in the consideration and operation of programs as marketing orders. I venture to say that without what the economist can honestly offer, both the Director and industries would err more often and to a greater extent; in other words, we do help them to make smaller or less frequent mistakes.

In addition to the leglislative economic standards which guide the Director, there are other economic considerations. These may be considered in terms of the major functional activities which take place in the operation of the orders: administration, inspection, promotion, and research. Time permits brief comments on the economic implications of only promotion and research.

"Promotion" provisions are part of 23 of the 28 currently effective programs. The term "promotion" includes advertising, trade and consumer "education," the employment of fieldmen for retail point-of-sale displays, and similar activities. In addition to the large proportion of programs

which use promotion provisions, another indicator of their role in California marketing programs is that of the total expenditures, for all activities under all programs, made in 1955, 67 per cent is classified under "promotion." Sales promotion and advertising are carried on to affect consumer demand, hence, affecting the derived demands at the handler and producer levels. In conventional economic analysis, consumer demand is generated by the interaction of consumer utility surfaces, income, and prices. Advertising attempts to change the structure of the consumer's preferences, thereby altering in certain directions his utility surface. Although we now hear much about depth interviews, hidden desires, and impulse buying, and advertising experts talk in terms borrowed from social psychology and group dynamics, the objective of advertising remains one of shifting demand upward by affecting the consumer's utility preference system.

One may ask what is gained by marketing program sales promotion since advertising can and is done by many private firms and organizations. The answer involves a basic feature of marketing orders noted earlier; if sales promotion is carried on under the authority a marketing order, everyone in the industry must contribute to the financial support of the advertising. If the advertising is effective, each participant gains in a sense corresponding to the benefits a firm derives from the influence of Marshallian net external economies. Although Marshallian economies are generally associated with long-period cost and supply functions, corresponding effects on the revenue and demand functions can be considered to flow from influences external to the firm and which yield benefits common to all firms in the industry.

Marketing order advertising programs generate nonprice competition among products. Since, in the short run at least, the "human stomach is inelastic" and the total consumption of a group of products closely related in demand is relatively fixed, a situation can develop where industries believe they must advertise if only to hold their historical share of the market. In such a case, advertising is resorted to as a buttress against the industry's demand function shifting downward. This type of interaction between industries bears much resemblance to what, in a different context, Joan Robinson termed "beggar my neighbor."

For reasons we need not pursue here, most producers and handlers seem to have an immeasurable amount of faith in the effectiveness of promotion and advertising expenditures. Yet, objective and substantive results to support such faith are extremely difficult to develop. The disentangling of short-run and long-run results as well as multiplier effects, raise tremendous analytical problems. To answer simple questions often asked by industries, such as, "should we advertise" or "how much should

we spend on advertising" requires the boldness and confidence of an advertising account executive. The economists might reply in terms of short-run and long-run net marginal revenues and net marginal costs of advertising; but unless those functions can be operationally specified for the industry, it is helped very little.

In terms of frequency of appearance in currently effective programs, research ranks about equally with sales promotion and advertising. But in terms of total funds expended, research accounts for only 4 per cent, compared with 67 per cent for promotion. Such comparison is misleading, however, as an indicator of the relative importance of research in the operation of marketing programs. A very substantial amount of research is drawn upon by the marketing program industries from sources as the state university and for which no cost account is reflected in the figures cited.

The research activities in which marketing programs are interested or which they sponsor not only are economic in nature but often are technological, although the latter have economic implications. Technological research projects include, for example, improved processing methods for canned fruits, disease and pest control, improved varieties, development of new utilizations, improved equipment, and similar studies carried on by technical departments and organizations. In terms of economic terminology and implications, such researches have the objective of discovering and developing new production functions. Their economic relevance is bound in with the analytical concept of cost functions being generated by the interaction of production functions and their derivative functions with the cost rates of productive services. As cost-reducing methods of producing "old" products affect industry returns through the cost side of the profit equation, methods of producing "new" products affect industry returns through the revenue side of the profit equation. The industries with marketing order provisions for research are well aware of the economic implications, and to them production, processing, or marketing research is a source of increased profits or decreased losses.

Economic and statistical research is drawn upon by a number of the marketing programs. Of particular concern to those programs having a volume regulation provision are the economic characteristics of the demand functions facing the industry. Knowledge concerning price and income elasticities, for example, as well as measures of demand relationships among various products are necessary for a rational operation of the volume-regulation provisions. This is not to suggest that all programs have at hand, or seek to acquire, such economic relationships. The range of "economic awareness" varies among the programs; some ignore economics in its analytical sense and some "play by ear"; but several reach

for, probe into, and consider rather sophisticated and technical economic relationships.

In addition to economic researches pointing to the demand side of the market, increasing attention is being given to supply. For purposes of planning marketing policy, several of the programs—cling peaches, bartlett pears, and lemon products, for example—are helping to finance researches in objective preharvest sampling forecasts of the prospective supplies available for marketing. Reliable and timely forecasts of supplies to be harvested are of particular concern to the orders utilizing the volume-regulation provisions.

All of the various types of quantity control have as their primary objective the increasing of returns from the sale of the crop. But in each case, the particular effects on prices and returns depend upon the nature of the relevant supply and demand functions, their price and income elasticities, their stability over time, and their sensitivity to developments in related products. The economic rationale, in the most elementary case, involves price elasticity; while less simple cases involve economic theories of price discrimination, market segmentation, and multiple products.

The problem of multiple products stems from the interaction of crops which are competing in demand, or which are produced and marketed in competing areas. Interregional and interproduct competition cannot be ignored in the operation of volume control. A marketing program which disregards the indirect as well as the direct economic effects on competitive products or competitive regions is eventually likely to find its objectives frustrated and its long-run relative market position affected.

Some Observations

The operation of California marketing programs, with their apparent "success" in the opinions of many participants and observers, has attracted rather widespread attention from various commodity groups in other states. Information seekers often suggest that if they "only could have a marketing program," their problems would be solved. Such generalization, however, may be ill-founded.

Valid economic generalizations about joint industry-state marketing programs are difficult, perhaps impossible, to formulate in meaningful and helpful terms. There are so many different types of programs which can be developed and each commodity has its own particular problems and circumstances. One generalization, however, can be noted with some confidence. Joint industry-state marketing programs certainly are not a mystical and all-powerful curative of marketing problems. Rather, such programs are institutional economic devices effective only for certain types of problems under particular circumstances.

Much too often marketing programs are viewed as acceptable substitutes for necessary production adjustments. Where chronic and persistent "overproduction" occurs, marketing programs are at best only a palliative to provide time and aid for easing into the basically necessary production adjustments. Where cyclically depressed demand imposes producer returns less than out-of-pocket costs, marketing programs can help to retain productive capacity appropriate for the time when the business cycle turns up again. In this respect, an example is that of tree fruits from orchards representing capital which can be reproduced only over a period of years.

Although marketing programs were "depression bred," with the passage of time they have become "prosperity fed." Of the 28 marketing programs currently effective in this state, definite expiration dates now prevail for only four programs, and they may be continued with reinstitution; the other 24 programs have "continuous" terms of operation and continue on until a contrary decision is made by the industry or the Director. It is clear that marketing programs have become a permanent part of our marketing institutions.

The characteristic of being "depression bred and prosperity fed," however, is not unique to marketing programs. More or less similar degrees of metamorphosis are evident in many other of our economic and social institutions: unemployment, old age and survivors' insurance; federal and state employment offices; bank and building and loan deposit insurance; home-mortgage insurance; labor-management legislation; and many others, including the federal loan and storage price-support programs. But an important institutional difference between the California marketing programs and the federal price-support programs is that the latter are a victim of political controversy. California marketing programs, however, are not a subject of political debate in the state. This does not mean, however, that they are completely noncontroversial. Conflict of interests often prevails within an industry, and it is not unusual for producers and handlers or even different groups of producers to take different positions on the acceptance of proposed marketing orders.

The conflict of economic interests within an industry can be resolved, for administrative and operational purposes of marketing programs, through a voting procedure specified by legislation. But the conflict of economic interests among consumers, producers, and handlers cannot be resolved by that procedure. Consumers, as such, have no direct vote in the acceptance or rejection of marketing programs, although consumers do have a powerful and telling voice when they register their votes with dollars and cents at the cash registers of retail outlets. The legislation clearly specifies that consumer interests are to be represented and con-

sidered by the Director in his judgment and operation of marketing programs. The proposal that consumers be given an independent voice in the promulgation and operation of marketing programs is not heard as frequently in recent years as in the past. One may suspect, moreover, that such a proposal would not be given serious attention in light of the still remembered experience with the Consumers Council of the prewar Agricultural Adjustment Administration.

Marketing programs were not discovered in a social science laboratory, developed in a pilot economy, and brought into practical use only after perfection through market tests. On the contrary, the forerunners of the present marketing programs were put together and into effect under the pressure of current problems needing attention in a depression-ridden economy. Among early participants, agricultural economists are well familiar with the names—alphabetically: Elmer Braun, Chester Davis, Bud Holt, Bill Kuhrt, Si Smith, E. A. Stokdyk, Jessie Tapp, Howard Tolley, Fred Waugh, Harry Wellman, and Fran Wilcox. During subsequent years, in considerable part through trial and error, marketing orders were developed in their economic, legal, and administrative dimensions into an articulate and flexible institutional organism.

Although marketing order programs now have various types of provisions, that of volume control has always attracted the most criticism. Yet, economists have continuously been aware of the double-edged features of volume control. Almost twenty years ago, Harry Wellman cautioned that, "Marketing control schemes which are designed to limit the total supply marketed for the season as a whole are . . . essentially a palliative and should be . . . used only in acute situations . . . to go beyond that is to court disaster."[2]

Over the years various economists have attempted to introduce and develop rational economic consideration of long-run as well as short-run impacts of the programs. In order to understand fully the marketing programs institutions, economic analysis is necessary although not sufficient. Also necessary are phases of law, administrative science, statistical analysis, political science, social psychology, and perhaps a bit of psychiatry. It appears that economists will continue to work thus with marketing programs until the Ford Foundation produces full-blown "behavioral scientists."

As commodity groups work with marketing programs, considering but not always following the counsel of economists, the industry participants gradually learn economic principles and come to appreciate economic

[2] Wellman, H. R., *Controlled Marketing with Special Reference to California Fruits and Vegetables* (Berkeley: University of California, College of Agriculture, Agricultural Experiment Station, November 16, 1938), pp. 9-10. Processed.

analysis. In some programs the industry participants have accumulated a rather sophisticated understanding of the economic principles involved. Such industry people may not use professional jargon, but they are learning the significant economic relationships. It may well be that in the long run the spread of "economic literacy" will prove to be the most significant result emerging from the institution of marketing programs. As Marshall has said, "Economic laws and reasonings in fact are merely a part of the material which Conscience and Common-sense have to turn to account in solving practical problems, and in laying down rules which may be a guide in life."

CANADA'S PRICE SUPPORT POLICY AND ITS PERFORMANCE

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IN CONSIDERING assistance and security provisions for agriculture, Canada has attempted to emphasize production and marketing efficiency so that quality, quantity and cost would provide not only for an adequate supply of food for the domestic market at reasonable prices but also a substantial flow of agricultural products to external markets. In earlier days, and even today, Canada to a greater or lesser degree has assisted in the extension and intensification of commercial agriculture throughout the country. This has meant that the Canadian economy is dependent to a considerable extent on the income from the production and distribution of agricultural products, a substantial portion of which comes from the sale of these agricultural products entering export trade.

As Canada grows industrially and enlarges her own consuming population, the proportion of agricultural products exported will likely lessen, as it has done over the past few years, though the volume and dollar value may remain constant or increase as a result of the greater capacity to produce both at farm and processing levels. Due to the significant part that agriculture and related industry play in the economy as a whole, as well as in export trade, government assistance and aids to agriculture in Canada have usually been justified on the basis of an investment return through greater efficiency somewhere in the production or marketing process either immediately or over the long run.

Canadian taxpayers at both federal and provincial levels have, in addition to their payment for research, extension and administration of legislation, given a wide variety of assistance to agriculture over the years, including: encouragement of immigration, financial aid to reclamation, rehabilitation, conservation, irrigation and land settlement programs, improvement programs for livestock and crops, including the distribution of good breeding stock and better varieties of seed, premiums for quality production, assistance in eradication of disease, maintenance of grade standards, encouragement to agricultural and cooperative self-help agencies in their attempt to improve production and marketing efficiency, as well as many financial aids to facilitate orderly marketing, including subsidies to public cold storages and the actual ownership of terminal elevator facilities and cold storages. Many of these types of payment have now been accepted without question as basic needs in the general economy.

The Canadian government's first line of attack in attempting to assist the continuance of the present era of postwar prosperity and economic

development has been an approach through broad fiscal, monetary and credit policies aimed at retaining and aiding the development of initiative, enterprise, and maintenance of full employment in a gradually progressing economy. In addition to the broad policies developed for full employment the government has attempted, through the use of broadly based security or welfare measures such as family allowances and government pensions of various kinds, to provide for a wider distribution of incomes to individuals, whether they are capable of productive work or not. By the use of such fiscal policies, taxpayers have aided in the general demand for agricultural and food products. Provisions have also been made for dealing with the problems of individuals and groups through systems of contributory unemployment insurance as well as price legislation which can be related to individual agricultural and fishery products as may be deemed necessary.

In agriculture there is considerable legislation available for producers that allows them to join together to undertake, through self-help schemes, the operation and financing of more orderly marketing to help farmers secure the maximum returns from their products. In addition the state has been authorized to take complete control of the marketing of wheat and coarse grains from the prairie provinces of Canada, under the Canadian Wheat Board Act. In the case of other agricultural products, provision has been made to intervene in the pricing system through the provisions of the Agricultural Prices Support Act passed in 1944. These two acts have been designed for the purpose of at least modifying price fluctuations that may be sharp from time to time in the so-called free market. I do not think many Canadians would claim that in providing for this intervention in the pricing system the government should or would prevent price fluctuations, either up or down, but it has been the hope of the sponsors that the government may influence the price curve sufficiently to make price fluctuations more gradual and to round the points particularly at the bottom of the curve.

Farmers in Canada have generally been willing, with some exceptions, to allow some cream off the top of the bottle or the price curve to flow to consumers and taxpayers provided bankruptcy prices for the bulk of the farmers do not prevail at the bottom of the curve. For example, the Wheat Board has in practice avoided a selling price to Canadian millers above that which has been received in international markets, even at times when bulk contract prices were probably somewhat below what might be justified for sales in the domestic market. On the other hand, wheat farmers have had financial aid through the Prairie Farm Assistance Act and the Prarie Farm Rehabilitation Act. The Treasury has also provided one payment in the pool in the postwar period to increase the returns resulting

for the years of bilateral United Kingdom contract, and recently has provided for payment of some storage charges. Similarly, the Agricultural Prices Support Board has sold all but a limited quantity of the stocks it has acquired into the domestic market at an appropriate time rather than let the price rise quite as high as it might have due to buoyancy in the market, thus tending to modify or smooth the top of the price curve for the products concerned.

The Canadian Federation of Agriculture, in a recent policy statement, has outlined their suggestion for a sound program of government price supports as follows:

"Farmers should not expect society to subsidize the inefficient producers. Price supports, however, need to be established at levels which will:

(a) provide a minimum level of return per unit of production enabling the most representative group of producers of any commodity to continue in production;
(b) facilitate orderly production adjustments within agriculture; and
(c) prevent undue fluctuations of market prices and production."

Agricultural Prices Support Act

Price supports have been given at various times throughout the years in addition to other aids to agriculture. However, in 1944, partly if not wholly as a result of the acceptance by farmers of price ceilings during wartime, the Parliament of Canada provided a formal basis for agricultural price support for all products except wheat for the transition period from war to peace. As has been noted, wheat is provided for under other legislation. The Act is known as the Agricultural Prices Support Act and producers may turn to it, if need for price assistance can be established. The administration of the Act is placed in the hands of the three-man Agricultural Prices Support Board. At present all members of the Board are permanent civil servants. In addition provision is made, and there is at present a general advisory committee chaired by the President of the Canadian Federation of Agriculture and including deputy ministers of agriculture from all provinces as well as producer representatives from the main agricultural regions and commodity groups. Other special advisory committees may be called on at any time to assist the Board in its operations in a particular field, either from the trade or from producer groups. This has been done from time to time as seemed appropriate.

The Agricultural Prices Support Board has at its disposal a revolving fund of $200 million which is maintained at that amount by annual appropriations from Parliament to cover any loss that may take place during the year and, if there is any surplus in the Board's account, it is turned over at the end of each year to the Consolidated Revenue Fund.

Unlike support legislation in some other countries, there is no historical

price formula set out in the Act. The decisions as to the levels at which prices may be maintained or the commodities whose prices are to be supported are left to the Board to recommend to the government. In other words, there is nothing automatic about the Act and its application. However, it provides that the Board may recommend price support for any agricultural commodity (except wheat) which may be designated by the Governor in Council, including processed meat, dairy and poultry products. The usual procedure is for representatives of the interested commodity group to make representations to the Board and after the Board has studied the situation and considered the need a recommendation to the government that assistance be given will be made or the application will be rejected. If the application is accepted the Board will also recommend a prescribed price and the amount of assistance as well as the method of giving the support which it considers most feasible in the particular case. If the government approves, then the support program will be put into effect by the Board.

The Board can recommend assistance or support by either of two methods in accordance with the Act:

1. An offer to purchase by the Board.
2. Underwriting the market through guarantees.

The Board has been given broad power with respect to the level of prices it recommends insofar as individual commodities are concerned. The Act states: "The Board shall endeavour to ensure adequate and stable returns for agriculture by promoting orderly adjustment . . . and shall endeavour to secure a fair relationship between the returns from agriculture and those from other occupations." In 1950 the operative sections of the Act were made permanent legislation.

As was probably intended this leaves the Board room for considerable flexibility in their actions and, as mentioned above, the support level recommended by the Board has to be approved by the Governor in Council (which under Canadian parliamentary system means approved by an elected Cabinet responsible to an elected Parliament). Board recommendations are at times changed by Cabinet and may be rejected. In practice the Board has tended to stress the word "adjustment" and has endeavoured to adjust toward a position of supply-demand equilibrium which may seem economically feasible, either in the short or the long run. The attempt has been to reach a point where the product under support can eventually be left to find its own price level in the market place, even though a support price may be continued to protect against any unusual seasonal price changes. In other words, most Board recommendations are made following serious consideration (with the producer group or groups

concerned and often with the trade representatives as well), about a solution to the problem that will eventually lead to little or no government intervention in the pricing mechanism, unless a further problem develops. The ability and willingness of such groups to aid in carrying out suggested solutions may be a factor in the recommendation and is regularly appraised by the Board in considering any application for a support program.

Although there will be some element of welfare in any primary-industry price-support program, it has generally been considered, in Canada, economically sounder and much more efficient and equitable to deal with the welfare problems of agriculture more directly than through government intervention in the pricing system. Under the above-mentioned adjustment policy in the direction of short or longer term supply-demand equilibrium, it has been considered that if the price adjustment is undertaken in the right direction it will eventually be reflected in that degree of adequacy, stability and fair relationship or parity that the Canadian taxpayer can afford on behalf of cushioning producers through emergencies and helping to give a smoother roll to the price curve which might otherwise be jagged.

Decision as to the level of price for a product to be supported as well as the general direction of the future demand and supply for product involves considerable judgment, probably a polite way to say "trial and error." Among economic and statistical guides that may be used in this judgment are the following:

(a) Historical price information.
(b) The basic cause of the price or income decline.
(c) The supply of the commodity.
(d) The long-term market possibilities for the product.
(e) The problems of storage and disposal likely to be involved.
(f) The relative efficiency of the producers concerned along with possible alternative sources of income.
(g) The number of producers affected and the possibilities for more self-help among them with or without government aid as well as the regional nature of the problem.
(h) The implications of precedents being established.

Under the Canadian Prices Support Act action to support prices may be taken at any time during the season and in fact often has been delayed in the case of perishable crops like apples and potatoes till those who are in the position or have the facilities to market their crop throughout the season will be the main beneficiaries. Similarly, quality is given high priority in Board proposals and it is usually only top grades of a product which are supported.

Before turning to examples, I wish to say a word about disposal. The

Board has no statutory limits placed on it in the Act insofar as disposal of the product is concerned. Unless the Cabinet makes a regulation the Board legally may give the product acquired away, destroy or sell it. In practice the Board has attempted to sell on a commercial basis and at all times has been quite conscious of minimizing the loss to the taxpayer. It also refers any proposals that involve substantial loss to the Minister and he in turn may refer the proposed action to the Cabinet. This is done not only because of the loss involved but in order to minimize possible interference in policies of other departments of government. If the Board can sell at cost or better, it usually proceeds to do so without reference to higher authority. Generally speaking, the Board attempts to sell at no more than cost including carrying charges, even though once or twice it has made a profit when sales were made more quickly than estimated and carrying costs were lower than anticipated. Whether or not it sells at cost, the Board always tries to sell to the best advantage possible. Very few commodities acquired under price support in Canada have been donated or given away by the Board and those which have been were given away as relief aid but not as a means of disposal. Again it is considered that if gifts or donations are to be made, the money should be made available through the appropriate department of Government and this department of Government may deal with the Board or direct their dealings through a welfare agency or the trade who in turn will deal with the Board on a commercial basis if it is a price-support commodity that is required.

Most of Canada's products acquired under the Agricultural Prices Support Board have been sold in the domestic market with relatively small quantities being sold for export, usually to clear up a small residual in certain operations or to facilitate extra disposal at a point of time. Export sales of Board products may or may not be made at a loss, but in all cases an attempt has been made to get the best world price for the quality and quantity of product available under the current situation.

Canadian trading firms, as well as export and import firms both in Canada and abroad, cannot be given too high praise for their efforts to cooperate with the Board and to be realists about markups in handling and disposing of the small proportion out of the total product acquired by the Agricultural Prices Support Board. The trade is aware that the Board intends to sell a product as quickly as possible after acquiring it and in the best market possible, so usually suggestions come forward voluntarily but, as mentioned above, trade advisory groups are called in from time to time so that the Board may benefit from their collective as well as their individual views in arriving at a decision.

Selling programs have also been worked out with the trade so that stocks of semiperishable products may be turned over or exchanged and

thus avoid any undue deterioration in quality. Theoretically under this system any extra quantity of semiperishable product can be maintained in store on a high quality basis as long as a nonperishable product at relatively small cost, but there are some practical limitations in certain instances.

A few examples of Board operations are now listed and, although not complete, they have been outlined in an attempt to indicate some of the actual performance of the Board.

Creamery Butter

There has been a price support on creamery butter continuously since 1948. Up until this time the dairy industry had a residual market for cheese in the United Kingdom, but the exchange situation was starting to cause difficulties in that market. In addition the Canadian government ban on margarine was declared ultra vires of the Federal Parliament. The government decided mainly as a result of these two facts to support creamery butter, a product with a relatively high seasonal variation in production but almost entirely a domestic market product, as the basic national support for the dairy industry.

Since the beginning the price has been set in advance of the production year. In 1950 the Board had a carryover of some 20 million pounds and there was an apparent drop in domestic disappearance of butter. In these circumstances the Board reduced their price support from 58 to 53 cents per pound. Within the next year a butter shortage developed and the government and the trade, in order to protect consumer as well as long-run producer interests imported about 22 million pounds of butter at from 61 to 63 cents per pound from European and New Zealand producers. The price support was revised upward to 58 cents and extended for a period of two years. An interim price support of 63 cents for a limited quantity of 10 million pounds, to provide for the immediate consumption of the European butter in exchange for domestic butter to be held in storage, was also introduced. The support price has remained at 58 cents since this time and usually on a two-year forward basis.

In 1955 when stocks became heavy the Board was authorized to extend the policy for only one year since there were many advocates of some reduction of the support price in order to clear stocks. However, during 1955 domestic disappearance continued to increase as it had since 1951. In 1956, with some prospect of domestic disappearance again equalling or being greater than current production, the government reverted to the two-year advance price announcement.

Details of interest in the support program for butter such as turn-over or exchange operations, storage, buying and selling problems are numer-

ous and I only wish there was time to discuss them all in this paper. If the price support net cost of $8,542,378 to March 31, 1956, for 8 years, is considered against the total volume of creamery butter produced and traded at or above the support price in Canada during the period of price support, it amounts only to a small fraction of one cent per pound that taxpayers generally, whether they use butter or not, have contributed to the basic support operations for the dairy industry. Although under import control the government has imported adequate quantities of butter during short-supply periods to stabilize the price to consumers.

The Board has required butter to meet relatively high standards in packaging and quality if it is to be offered to the Board and has only supported Canada First Grade. All butter is regraded at time of resale. Even though much of the butter has been stored for 12 to 18 months, the deterioration below first grade at time of sale out of storage has been about 5 per cent over the eight years of price support. There has been much knowledge gained through the large-scale national operations of the Board that the trade can use to advantage with respect to packaging, storing, and related operations.

Shell Eggs

The government has had a continuous support price of 38 cents per dozen for Grade A large eggs delivered into storage to Board specifications since 1950 when Canadian contracts with the United Kingdom for eggs ceased. This support operation is based on a deferred offer to purchase whereby on application the trade is issued lot numbers for eggs that meet price-support requirements. The Board does not actually take or seek ownership until an appropriate period late in the marketing year, unless it sees fit to do so in order to encourage sales.

Throughout the year the Board reserves the right to call any eggs stored to its specifications, and if the trader does not give up the eggs he has to give up his right to deliver them to the Board at the support price later in the year. The Board has called eggs at various times during the year so that they may resell shell eggs rather than processed product. In 1954, the Board had eggs stored to its specifications as in other years but a great many of these eggs were stored by the trade after purchasing at prices actually above the equivalent of the support price. The result was that the trade could not immediately take advantage of export or other markets available at a satisfactory price in relation to the support price, since the prices they had paid to producers were higher. There was probably not enough extra demand to solve the whole marketing problem, but it was known that the export market would have taken a substantial quantity of the eggs finally bought by the Board in that year if the asking

price had not been quite so high. The Board finally bought the eggs near the end of the year (at considerable loss to the trade), broke them and processed them into frozen whole egg for Board account. The Board held this melange in store until it was deemed appropriate to offer it on the domestic market in the following year. The Board reviewed its specifications, as a result of this experience, and now refuses to store any eggs to its specifications that are purchased by the trade from producers above or below the equivalent of the support price. They also now refuse to issue lot numbers at times when market prices anywhere are adequate to provide some profit on the resale of eggs purchased at the equivalent of the support price.

Hogs

Support prices on hogs have been in effect each year since the termination of the United Kingdom contracts in 1950. However, the market price has remained consistently at or above the support price all years since 1950, except 1952 when the United States embargo on livestock from Canada was in effect due to the foot and mouth disease in the Regina area of Saskatchewan. Prior to the foot and mouth embargo, the Board had expected some problem with hogs and had worked out a system of purchase for primal cuts on a deferred offer to purchase type of program after the summer season of higher prices had taken the maximum out of storage. This offer had been worked in an arrangement whereby the packers and other buyers would maintain the support level during the winter and spring seasons on markets throughout Canada. Following the placing of the embargo on hogs and hog products to the United States, it became obvious that, with the main export market outlet for hog products cut off and with the general shortage of storage space in Canada, the deferred purchase of primal cuts would not do the job. A system of canning pork was introduced and the Board negotiated a price for processing a whole hog into cans. The price was worked out at a sufficiently high level to interest enough canners to undertake the job in order to get the required quantity of surplus hogs canned. Probable marketings were somewhat underestimated and as a result canning operations were developed on a larger scale than had been at first anticipated. Arrangements were also made to revise grades for hogs for a period of time so that heavier hogs would be classed in higher grade and thus encourage farmers to keep the hogs for some extra time on their farms.

A little later some hope was held out for transferring some Wiltshire sides to the United Kingdom and a program for purchase of Wiltshire sides was adopted. The United Kingdom unfortunately had an excess marketing of hogs itself that spring and was not interested in Canadian

product. Canning, therefore, continued. Toward the end of June the market for canned hams and backs became attractive in the United States and as canned and cooked products were not barred under the foot and mouth embargo, substantial volume of trade began without benefit of subsidy.

With respect to canned pork which had accumulated quickly, the Board after giving all interested trade about two weeks' individual notice undertook about the end of July 1952 to subsidize sales of canned pork in the Canadian market by reducing the price 40 per cent below cost. The notice was given so that inventories might be sold in the best manner possible before public announcement of the sale was made. A unique cooperative effort on the part of everyone in Canada allowed the Board to sell at a rate about three times the annual consumption for a period of more than a year.

With the approval of the United States some supplies were sent to that country at a price equal to the Canadian selling price plus freight, duty and commission charges. A year later in the fall, the Board decided that the balance of the canned pork should be sold at export after the Canadian trade had been given an opportunity to purchse such advance supplies as they might wish. As a result, the final sales were made at a lower price to Germany with considerable amounts disappearing in their Christmas trade in that country.

Canadian officials declared Canada free of foot and mouth disease in August but the United States embargo remained on till the following March (1953), even though there had been no spread of the disease from the one area in the Prairies. Canned pork remained the main basis of taking over supplies of product, surplus to the market. By means of a buying and selling operation the Board took over the storage cuts that had been stored to their account earlier in the year and resold them to the trade, less the cost of storage. Similarly, they resold Wiltshire sides back into the domestic market during the summer months at a loss about equivalent to the storage costs. Thus in the midst of the purchase program the Board was actively selling (or exchanging) product, including canned pork, in the domestic market when opportunity offered.

In addition to canning, balanced primal cuts were purchased for Board account for a period in the fall. In September the Board was authorized to announce that a reduction in price of three cents per pound carcass weight would go into effect on January 1, 1953, since the supply, even under ordinary circumstances, had apparently been underestimated. The month of December saw considerable misjudgment of the future by producers and the trade, since before January 1st almost every hog of a reasonable size and almost every cut or carcass held in inventory by the

processors had been turned over to the Board on the expectation that the market price would follow the support price and drop after January 1, 1953. In January the price of fresh pork did not go down but actually went up. The cured product was supplied by the Board to the market at the equivalent of the new support price on a limited basis. However, pork prices continued firm and the Board sold the balance of its cuts and other products, except canned pork, with little loss except for the first few weeks of the new year when they had adsorbed some loss by selling at the equivalent of the new support price.

Cattle

No price support for cattle was contemplated as in the case of hogs but in 1952, shortly after the foot and mouth embargo on sales to the United States, cattle were put under support. Many varied operations were necessary to carry out this support program.

In the beginning, with the cooperation of all the provinces, producers were urged to hold back cattle. Chain stores and other buyers were urged to cooperate and not to place undue pressure on lowering prices for a few weeks, until a method of disposal had been developed. Storage was at a premium in Canada. Canning beef was thought to be too expensive and risky an operation for the Board to undertake on a large scale. Finally, under a four-way international agreement, Canada shipped carcass beef to the United Kingdom. The United Kingdom paid for it with New Zealand beef which the United Kingdom had under contract at New Zealand port. Canada arranged with the United States to allow this New Zealand beef to be sold for their account in the United States, in line with United States beef prices in that country by regular meat handling firms hired on a commission basis by the Canadian government. Some 70 million pounds of Canadian carcass beef were shipped to the United Kingdom under this arrangement and the equivalent of New Zealand beef was brought into the United States for sale. Although the final result was rather costly in terms of dollars, it did do the job and cleared the market of sufficient beef to maintain the support level for the great bulk of Canadian cattle marketed in the domestic sales channels.

The United Kingdom preferred not to accept beef from packing plants in the areas immediately adjacent to the regions of foot and mouth disease. In these adjacent areas the Board maintained a buyer on auction markets to make sure that the support price was maintained, and for a time pastured about 1,000 head of live cattle it had purchased at these auctions. The Board also leased a packing plant in the adjacent area for a custom operation to process live cattle as the Board might direct. In the actual affected area, special pricing arrangements were made by

officers of the Board bringing packers and stores together and asking them to cooperate.

On October 1st, after Canada had declared herself free of foot and mouth disease, the Board was authorized to lower the price support for cattle by two cents per pound but the Board maintained the original price support for six weeks longer on heavy cattle in order to deal fairly with those producers who had cooperated in holding back cattle from the market at earlier periods.

Potatoes

Several programs have been in force for potatoes, but it is only proposed to mention the type of operation carried out with respect to the 1949 crop. In the last few months of the marketing season the grower was paid for No. 1 potatoes stored in his own bins, providing he did not resell these potatoes. The producer could feed the potatoes but many of these potatoes rotted or were thrown out on the fields. This is mentioned since it is the only operation in the history of the Board in which the product may have been destroyed.

Wheat

As is well known to this audience, wheat is the most important commercial agricultural product in Canada. It has represented as high as one-third of the total product of agriculture, and probably today represents at least one-fifth. It is not only an important segment of commercial agriculture in Canada but about two-thirds of the production is sold in the export market, which makes wheat one of Canada's leading export commodities. For these and other reasons, wheat has usually been dealt with by separate legislation as compared to other agricultural products, with the exception that other grains channeled through similar facilities are usually included with wheat.

Up until the First World War, wheat had been left to find its own price level through the open market. However, under the exigencies and emergency conditions developing towards the end of the First World War, the Canadian government took control of wheat marketing in 1917 and 1918, and paid a fixed price for wheat. In 1919, after a brief return to competitive trading, a Board was established with authority to take over the marketing of wheat and this Board instituted a compulsory pool with a guaranteed initial payment and, as it turned out, a substantial final payment as well. However, in 1920, despite protests from the farmers, the government withdrew and the farmers with the aid of the philosophy and organizing ability of a Californian, Aaron Sapiro, established their own wheat pools. These pools were intended not only to carry out a co-

operative and pooling operation but to exercise a substantial influence on maintenance of the export price at as high a level as possible.

In 1929-30 following the drastic fall in prices the government had to give financial backing to the pools due to sales returns being inadequate to cover initial payments. The period from 1930 to 1935 was one of attempts to carry out various stabilization measures to relieve the wheat surplus and low price situation which existed. Finally in 1935, after several years of urging by the farmers' representatives, the government of the day established the Canadian Wheat Board. The original Bill as introduced provided for a 100 per cent pool with a guaranteed minimum initial payment, but in committee a compromise was reached and the final Act as passed provided for two systems of marketing, or probably one should say provided for the Wheat Board to buy wheat on a guaranteed initial payment basis with all returns being pooled but producers who wished might also sell outright in the open market. The result of this legislation was that most producers sold through the Board if the initial payment was higher than the open market, but otherwise they sold through the open market. A new government taking office in the fall of 1935 named a new Board which required wheat to be kept in the market for sale constantly while the Board held stocks. In 1936-37 and 1937-38 the new government provided that the Canadian Wheat Board would only operate when the price of wheat declined in the open market below a price of 90 cents a bushel, and set the Board's guaranteed initial advance at 87½ cents per bushel.

History would seem to indicate that the government of the day may not have been particularly anxious to get involved to any greater extent in the wheat business and in 1939 may have made some attempt to get out of it through the passing of The Wheat Cooperative Marketing Act and The Prairie Farm Assistance Act. The Wheat Cooperative Marketing Act provided for government guarantees of initial payments where producers and selling agents agreed to pool their returns. The Prairie Farm Assistance Act provided some financial assistance to those farmers who didn't get a crop. The emergence of the Second World War as well as the substantial wheat acreages and world surpluses of wheat in the 1939-42 period kept the government in business. However, in 1943 the government felt it was necessary to protect wheat supplies for its allies, particularly the United Kingdom, and it finally decided to introduce a compulsory 100 per cent wheat pool in Western Canada to be operated by the Canadian Wheat Board with no further futures trading to be allowed on the Winnipeg Grain Exchange. In 1956 this compulsory pool is still operating, supported by all the wheat pools. In 1949 Manitoba tested by referendum whether or not farmers in that province favoured market-

ing oats and barley on a 100 per cent pool basis through the Canadian Wheat Board, and received a substantial "yes" vote. Apart from the producer wishes, the Canadian Wheat Board has proved a convenient business vehicle for the government to help handle price control during wartime, wartime and postwar bulk export contracts, and more recently the government's obligations under international trade agreements.

Wheat has been a relatively stable food product ever since Joseph's time, and probably since the beginning of mankind. The Bible reports that even Joseph's government in the public interest interfered with normal trading by storing up during the seven good years for the seven lean years. World supplies vary from time to time as they do in individual countries. Canada, for example, recently has been exporting at as high a rate or probably higher than in any postwar year. Domestic consumption in the aggregate has increased and wheat acreage has been reduced, but at present stocks and potential supplies from this year's crops may set a record. Years are rolling by and while it may not yet be seven full years it is quite awhile since the farmers could expect to deliver their full crop within the crop year. The Wheat Board maintains a system of marketing quotas at the producer level in order to attempt to equalize deliveries across the prairies. No acreage reduction plan or production quotas have been used since the war years but farmers have voluntarily reduced their wheat acreage from about twenty-eight million acres to a little more than twenty-one million acres in the current crop year.

There has been and is considerable agitation for payment of advances for grain stored on the farm. The government has not seen fit to undertake such payments but this year has provided for payment out of government funds of elevator and terminal storage charges on stored grain above what may be considered normal carryover at the end of the crop year, this payment of money to be added to the pool returns. The government has also provided for certain guarantees for bank loans on farm-stored grain. The government and the trade have been very active with disposal. Although they have introduced some credit arrangements through a Canadian government specialized foreign credit export agency established to help in the export of any product, their movement of wheat has been carried out on a commercial basis for Canadian dollar returns.

There are a great many more facets to the Canadian Wheat Board activities but time will not permit me to relate even those of which I am aware. It would appear that the Wheat Board, either in its present compulsory form supported by producer groups generally, and if not wholly in some measure by most political parties in Canada, may continue as long as there are international commitments or arrangements to be made

with other exporting and importing central control agencies. If the facts of the market place change, it is probable that some variation from the present system may be adopted. It is unlikely that a completely free market will develop for some time with national policies and world conditions as they are and appear likely to be. Many of those favoring the maximum of freedom in marketing wheat do not deny at present that the removal of certain price uncertainties for the wheat farmer may be a desirable objective and may even assist in some phases of production efficiency if it can be done; but they do object to any attempt to stabilize market prices at levels and places that may encourage uneconomic production or inefficiencies in marketing, particularly if the loss of any substantial export market may be involved. Some would no doubt be prepared to consider a system of supplementary payments to underwrite the existing market if there were drastic declines in price over the short run, others might favor the 1935-42 pattern of Wheat Board activity or some variation thereof. Whatever may be the outcome as a result of the reconciliation of various points of view it would appear that there is little to suggest that Canada will withdraw entirely from some degree of arranging or assisting in the field of wheat prices for the Canadian producer in the near future.

Summary and Conclusions

The introduction of legislation in Canada to support prices of farm products has come about through the prospect or experience of marketing difficulties and the need for adjustment rather than from the suggestion that there is an absence of markets. Parliament has recognized that national resources should be used for assistance to agriculture to the degree consistent with further development of that industry as an integral and important part of the national economy. Such price assistance as has been given has meant a relatively small investment cost for the taxpayer. This will probably remain the case as long as government continues to keep any product it holds moving to market on a commercial sales basis so that no unmanageable surpluses accumulate.

Constructive criticism, suggestions, and advice, which form part of our democratic way of life, have been sought and given as Canada moves cautiously into the sphere of assistance to smooth the price curves for agricultural products. Presently the strongest suggestion from those favoring further extension of the system of price supports is that a statistical formula, to provide a range of consideration within which the price level should be established, be included in the statute. The government has preferred to maintain a policy where historical price and statistical information, as well as all other factors, may be taken into consideration at the

time of setting the price level, thus basing this level on the actual situation existing and the problem to be solved. By not having to follow a fixed price formula in determining the level of price support, it has been possible for the Board to recommend levels for price support that operate in the general direction of equilibrium in supply and demand and thus aid in limiting the accumulation of surpluses.

Canada is trying to meet its general agricultural problems in the price field (1) by broad national policies to maintain an expanding demand in the domestic and export markets, (2) by encouragement of the greatest degree of self-help by those in the industry concerned so that production and marketing efficiency may be at a maximum level, (3) by assisting to maintain production and marketing facilities for individual commodities that may be placed in jeopardy during periods of temporary market problems, and (4) by providing a program of assistance that may be expected to supplement general over-all government policy during recession and depression.

APPENDIX "A"

Net cost of assistance under the Agricultural Prices Support Act from 1946 to March 31, 1956 classified by commodity.

1. Potatoes	$ 2,036,175.61
2. Apples	6,708,164.24
3. Dried white beans	194,419.88
4. Extracted honey	177,066.42
5. Dry skimmed milk	677,404.02
6. Cheddar cheese	155,348.82
7. Creamery butter	8,542,378.00
8. Shell eggs	673,194.39
9. Hogs	36,673,894.07
10. Cattle	33,358,015.86
Total	$89,196,061.31
Government payments into Wheat Board Pool from 1946 to July 31, 1956.	
Wheat	$96,486,000.00

SHORTCOMINGS IN CURRENT EXPLANATIONS OF NATIONAL FARM SURPLUSES

DON PAARLBERG
Office of the Secretary, United States Department of Agriculture

THE productivity of American agriculture continues to amaze most of us and to perplex those who would control it. During recent years, despite restrictions on major crops, successive all-time production records have been established. This year promises to be a near-record notwithstanding drought through the central part of the country and in spite of additional measures to check output.

We are experiencing a condition described as a surplus many years ago by John D. Black: "A volume of production continuing so large over a period that the producers of it have to sell at prices that will not allow them to operate with their accustomed profits, income and scale of living."

Dr. Black's definition conforms fairly well to what most people have in mind when they speak of a surplus. I am aware of the fact that the definition is subjective, dependent exclusively upon judgments of producers and hence more prone to discover a surplus than some other definition might be.

The size of the surplus is a controversial point. Certainly not all the $8.5 billion worth of farm products owned by and under loan to the government is surplus. Undeniably, a large share of it is. Not only is there an accumulation of surplus stocks for particular crops like wheat, cotton and corn. Current production of these and other products has run ahead of commercial outlets. If we consider the surplus to be that quantity of current production that will not move through the commercial channels at the supported price, but must be stockpiled or moved at home and abroad by extraordinary governmental measures, then the surplus is considerable. During the past three years dispositions of government-owned stocks have totaled about $6 billion, and in spite of this there has been a net accumulation in government hands of about $6 billion more. This makes a yearly average takeover of about $4 billion, or more than 10 per cent of gross farm income.

Agricultural surpluses, both as accumulations in the hands of government and as excessive current production, have persisted in recent years. This is in the face of such favorable basic conditions as unexpected population growth, record nonfarm civilian employment, a fairly stable general price level, rising per capita real income, high-level per capita consumption of foods and fibers, improving economic conditions abroad, and vigorous government efforts to restrict production and dispose of sur-

pluses. Indeed, even if surplus stocks could be eliminated, a highly important tendency to surplus production would continue to exist.

All of this presents a baffling problem.

There has been no lack of explanations. From the many explanations that have been offered I have chosen five, which I propose to discuss: (1) improved weather conditions, (2) loss of export markets, (3) perverse response of supply to price, (4) advancing technology, and (5) price supports.

1. *Improved Weather Conditions*

An explanation frequently heard for the high level of agricultural production is that in recent years we have been experiencing better conditions for crop growth.

Measuring favorable or unfavorable weather influences, on a nationwide basis, over a period of time, is extremely difficult. Gross departures from trend of individual years in yield per acre may be picked up and attributed to weather, as the unfavorable year 1934 or the bumper year 1948. But to what factors shall we ascribe the trend itself?

The idea of an established weather cycle rests on shaky foundations, though the bunching of good and bad years in unpredictable patterns is a recognized fact.

The effect of weather is usually measured, when it is measured, as a residual. Thus, in addition to the effect of weather, there are included all the errors in the attempted measurement of known factors plus the influences of factors other than weather which were not being measured.

I shall venture no evaluation of weather influences in the current high level of agricultural production. I suspect, however, that much of the improvement attributed to weather is in fact due to technology, and that with the advance of technology weather becomes less important than it was before.

2. *Loss of Export Markets*

Another explanation of the surplus frequently heard is that war and postwar export markets have been lost. This loss of markets is variously attributed to the recovery of world agriculture and to price supports.

Certainly it is true that world agricultural production has increased, partly under the price stimulus we have provided. It is true that we have, to a degree, priced ourselves out of foreign markets.

Exports of farm products dropped 30 per cent from fiscal 1952 to 1953. Since then, with the help of a variety of special programs, exports have increased. They rose 4 per cent in fiscal 1954, 7 per cent more in 1955 and an additional 11 per cent in 1956. Total exports of all American farm products this year, excluding cotton, were at the highest level in 30 years.

The newly developed export program for cotton will result in increases for that crop.

The high current level of exports does not rule out the loss of export markets as an explanation for our surplus. More than one-third of our agricultural exports were moved out this past year with some form of government help. Among these are export subsidies, sales for foreign currency, special credits, barter and donation.

The aggressive and ingenious government programs now in operation have obscured the adverse competitive position in which farm export products find themselves. The loss of export markets is indeed a cause of the surplus, though perhaps a lesser one than is commonly assumed.

3. *Perverse Response of Supply to Price*

There is a belief, held by considerable numbers of people, that if prices fall, farmers generally will increase their production in order to maintain their incomes. The high level of current output is thus explained as a consequence of the general decline in farm prices that began in 1951.

This is more a rationalization of the desire for higher prices than an explanation of economic behavior.

Admittedly we do not know as much as we should about supply responses in agriculture. But available statistical evidence does not support the notion of a perverse supply response. The problem has been studied by a number of scientists: Bean, Black, Cochrane, Elliott, Farnsworth, Galbraith, Haas, Johnson, Jones, Kohls, Lorie, Pearson, Pubols, Schultz, Waite, Walsh, Warren, Wells and others.

What have these researchers found? I think the findings can be generalized with some confidence.

They have found that the effect of price on supply is generally vague, but insofar as it exists, it is highly inelastic and positive, not negative. It is not perverse. They have found that for individual farmers, many factors rank ahead of price in importance as a determinant of output. They have found that individual commodities respond more readily to the stimulus of price than does aggregate agricultural production, and that an expansion of production is much more readily induced than a reduction. Researchers have found, however, as in the case of Argentina, that sizeable and prolonged price reductions do eventually bring about a decreased supply. They have found that relative prices are more important than absolute prices, that the response of supply to price may be affected by fluctuations in economic activity, that price expectations are more important in determining output than the particular level of prices prevailing in the past, that a farmer's actual production performance often differs from his intentions because of weather, that alternative opportu-

nities are important in modifying the effect of price on production, and that the response of supply to price is delayed because the factors of production have limited mobility. In general, they have found that livestock respond more readily to the price changes than do crops.

Farnsworth and Jones point out in the June 1956 issue of the *Economic Journal* that occasionally some one claims to have found a perverse supply response, just as occasionally some one claims to have found the abominable snowman of the Himalayas. But no one has yet satisfactorily documented the perverse supply response or produced the hide of the abominable snowman.

The argument for a negatively sloped supply curve runs into logical obstacles that are formidable indeed.

If a lower price means higher production, this higher production must, by the laws of demand, result in a still lower price. At the next stage, if the relationship still holds, this still lower price would mean still higher production. In the absence of intervention, no equilibrium position could result and no acceptable pattern of resource allocation could develop. We would be without any explanation for the generally acceptable balance of supply and demand for unregulated crops and livestock products over considerable periods. We would be without any explanation of the generally tolerable balance that developed for many crops prior to the Great Depression.

A negatively sloped supply curve would be a kind of sorcerer's apprentice who keeps fetching water until everything is engulfed. Or it would be like the magic mill that was commanded to grind out salt and did so, the command to stop having been lost, until in time it turned the sea itself to salt. These concepts belong in our poetry and in our folklore, not in the councils where serious matters of farm policy are being resolved.

Some may say that the concept of a perverse supply response applies only to a limited segment of the supply curve. But I have not seen these limits defined. And even within these limits, a perverse supply response could yield no equilibrium, such as has been observed to occur in the absence of regulation.

I have tried to draw a negatively sloped supply curve that would meet the test of logic and of observed economic behavior but have been unable to do so. Nor has anyone else, to my knowledge, been able to draw such a curve.

People are fond of saying that production increases when prices fall. They also say, quite rightly, that production increases when prices rise. What form of price behavior, then, brings about a decrease in production? We know that decreases occur.

Presently, some people maintain that a lower price means higher pro-

duction. Did these same people appear before the Congress during the war, when higher production was needed, and argue that reducing prices was the way to get the needed production?

By its acts if not by its words, the Congress has generally placed a correct interpretation on the effect of price on supply. When added production was needed, as in wartime, support prices were raised. When lower production was needed, as with potatoes, or more recently for basic crops generally, the support price was lowered.

It will always be possible to find a farmer, or a crop, or a year, for which the things I have said appear not to be true. I am aware of the fact that individual persons, under special circumstances, might increase production if prices fell. Generalizing from a particular case or from a particular circumstance is dangerous business. We must beware of the human tendency to observe and generalize from the unusual.

The reduced level of farm prices is not a *cause* of the surplus it is a *result* of the surplus.

4. *Advancing Technology*

The rapid advance of agricultural technology has been cited as being responsible for the surplus of farm products. I agree that this is one of the major causes.

We are experiencing a technological revolution in agriculture a revolution of a magnitude too great to be fully understood by those in the midst of it. There has probably been more technological change thus far in the twentieth century than in all the previous years of recorded history. Changes are cumulative and the rate of change seems to be accelerating. Changes are not limited to increased inputs of the factors of production in their conventional form. There has been a marked improvement in the quality of the people themselves as productive agents, chiefly through education. The whole level of the productive arts has been lifted.

This tremendous change has greatly expanded our ability to produce. Since the late twenties, output per worker in agriculture has more than doubled. And estimates suggest that output per unit of other factors used in production—land, machinery, fuel, fertilizer—has increased by at least 50 per cent.

This technological revolution has shifted the supply curve for agricultural products far to the right, more rapidly than the demand curve has shifted. As a consequence, the equilibrium price has fallen. Because of the inelastic demand for farm products the equilibrium price has fallen by more than an equivalent amount. Incomes were reduced.

Profound changes have occurred. Farmers who were first to adopt the new technology profited. The others were injured. Farm prices fell rela-

tive to nonfarm prices. The range from high to low in individual farm incomes widened. Capital requirements rose and necessary managerial ability likewise rose. The number of farmers decreased. Farming became more of a business than it had been, and less of a way of life. Political, economic and social institutions were shaken.

Some people think that the changes have come more rapidly than we can assimilate them and that we need a moratorium on research—both in the USDA and in the colleges. Possibly this would in time reduce the surplus, but it would deny us the advantages of improved technology. In the long run, greater efficiency is good for everyone, including the farmer. We must continue to improve technology in industry, labor and agriculture. Only in that way can we raise the real level of living. Farmers gain from this advance, partly by capturing some of the fruits of their own improving technology and partly through sharing in the advantages of technological improvements made by the nonfarm segment of the population. Sometimes they share as farmers and sometimes as members of society. But sometimes they don't share.

Farmers deserve programs that protect them from the harsh forces of unbridled technological change. Practically all physical scientists and many economists implicitly assume that our social, political and economic institutions are capable of assimilating, without serious repercussions, any technological advance that comes out of the laboratory. This is an unwarranted assumption.

It is possible to say that our surplus is largely a result of technological advance without condemning technology as such. Truly, progress is painful. But there is always danger that, in trying to avert the birthpangs of progress we may avert progress itself.

The challenge, to which our statesmen have called attention, is to make our new-found abundance a blessing rather than a burden. This calls for new mental horizons and new directions for research.

5. *Price Supports*

The surplus of farm products is frequently attributed to the fact that farm prices have been supported substantially and continuously above their equilibrium level. Production is stimulated and consumption is deterred. For a variety of reasons, controls stiff enough to maintain a balance are not invoked. Thus, despite production controls, a surplus results. I agree that price supports, along with technological advance, are a major cause of surplus production.

There is a substantial backlog of new technology available to those farmers who are in position to use it and who wish to do so. Even presently for cotton in the South, estimates of general response indicate that

on the average, rates of application are at a level at which an additional dollar spent for fertilizer would yield an additional return of about five dollars. Supplemental irrigation is another practice with tremendous potential for increasing productions. Of course, important applications of new technology have been made for many farm products without price supports.

The rate at which farmers will apply this backlog of technology depends on their knowledge and capabilities, on the level of anticipated price, the felt assurance that this price will prevail, and the availability of capital. A high level of support with an assured price greatly increases the rate at which new technology will be applied. As risk is reduced, the backlog of technology is drawn upon, capital flows into agriculture and new methods are adopted. This is particularly true if one factor of production—acreage—is limited. Technology, which is really a form of man-made capital, is substituted for land.

Improved production techniques are thus induced by the price-support, acreage-control program for the basic crops on the allotted acres. These techniques, once learned, are available for the other crops on the other acres. This is the demonstration principle that has been successfully used in extension work for 40 years, at work on each allotment farm under optimum conditions. The result, which should surprise no one, is likely to be an increase in total production in the long run—and perhaps even in the short run.

Price supports of the kind we have had stimulate total production. They also retard consumption, and they retard exports unless the government steps in with special export aids. Thus they work at both the supply side and the demand side to pile up stocks.

For cotton, studies by the Agricultural Marketing Service of the Department of Agriculture show that on a year-to-year basis, a 10 per cent increase in the price of U. S. cotton results in a 2.2 per cent decrease in the domestic mill consumption of cotton, and a 5.0 per cent decrease in free exports of U. S. cotton.

These year-to-year responses to a change in price are probably smaller than the changes that occur over a period of years if a given level of price support becomes semipermanent. The Cotton Council has studied the long-run demand for cotton, and has concluded that a permanently high cotton price would greatly stimulate the output of synthetics—which would gradually take over a substantial part of the domestic market.

The history of the last five years is informative regarding the effect of price supports on the farm surplus.

The surplus first appeared for the basic crops, especially wheat and cotton, the crops to which the bulk of the support activity was directed.

Acreage controls were applied to the basic crops. But advancing tech-

nology tended to cancel out the effect of the controls so that accumulations of wheat, corn, cotton, rice and tobacco continued to climb. Meanwhile acreage diverted out of the basic crops went into feed crops and ultimately into livestock. Total volume of agricultural production has shown a persistent increase despite controls.

Nothing that I have said argues against the use of price supports to introduce market stability. Nor have I found fault with the maintenance of reasonable reserves of storable agricultural commodities in the hands of government. I have not inferred anything odious to the distribution of government-owned farm products outside the normal channels of trade. I have not said anything prejudicial to the satisfactory working of the acreage reserve program of the Soil Bank if coupled with realistic levels of price support, which program would substantially and temporarily cut the acreage of certain crops and prevent the diversion of the acres to other uses.

All I have done is to point out that if prices are supported continuously and substantially above equilibrium levels, controls are unlikely to hold production in check and a surplus will develop. This is particularly true when a backlog of new technology stands ready to be tapped.

Price supports have speeded up the technological revolution in agriculture and have tended to socialize its consequences.

Summary

I have examined five explanations for the farm surplus. One of these, the alleged perverse supply response, has been rejected. Another, favorable weather, has been released for lack of evidence. A third, the loss of export markets, has been judged partially responsible.

Two explanations have been judged mainly responsible. Either of these two, advancing technology and price supports, was perfectly capable of itself to generate a surplus big enough to be troublesome. Working together as unwitting accomplices, they have created a record-breaker.

This paper would be incomplete without a brief summary of efforts to meet problems arising from the technological revolution and the excess supplies of agricultural products.

The law has been changed so as to permit adjustments in the level of price support, making the level of support dependent on the supply.

Massive surplus disposal programs have been developed, to use our abundant supplies constructively, outside the commercial channels at home and abroad.

A soil bank program has been written into law intended to cut production of those crops in heaviest supply and to devote a portion of our acreage to conservation uses.

Emphasis is being laid on the upgrading of diets, involving the use of

protein foods such as meat, milk and eggs, the production of which requires large amounts of our abundant land, labor and capital.

Research programs are being changed to devote more attention to new crops, new markets, and new uses.

A series of programs has been launched to lighten the impact of the technological revolution on disadvantaged individuals and areas. The Rural Development Program is such a program.

By these interrelated activities, hope is expressed to protect farmers from being harmed by their own magnificent performance. The hope is to gain, for farmers and for society, the fruits of advancing technology, and to preserve as large a measure as possible of the freedom and responsibility that have made American agriculture great.

The problem is a big one, even for this imposing battery of programs. We shall face the challenge, a wonderful challenge, of how to live with agricultural abundance.

DISCUSSION: ECONOMIC IMPLICATIONS OF CALIFORNIA AGRICULTURAL MARKETING PROGRAMS

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Dr. Hoos has done a commendable job of outlining the history and development of marketing programs in California as they regulate certain commodities other than milk. Due to time limitations he narrowed the subject greatly from that originally intended. He specifically excluded milk programs, both federal and state, and he excluded federal fruit and vegetable programs. This change was necessary due to time limitations, but let me further point out that a rather careful reading of his paper fails to reveal any clear-cut statement of the impact of the programs on competition in California agriculture.

Let us consider some of the similarities between the California programs and the federal agreement programs. First, both were depression born. Both have been continued because in the opinion of producers they have met a real need. Second, agreements have been replaced with orders in that they may make mandatory the coverage of all producers.

Now some of the differences. The objective of milk orders is primarily that of fixing minimum prices to producers and the operation of various types of pooling arrangements. The same is not true of the regulations affecting fruits and vegetables. Here there is no authority for the fixing of the prices of fruits and vegetables to the producer or at any point in the marketing process. No provision is to be found for advisory boards

in the federal legislation although the hearing procedure has been highly developed to get the advise of the industry.

Now let us consider the federal and state milk order programs and attempt to evaluate their impact on competition. The federal milk order program has been growing by leaps and bounds. In April, 1955 about one-third of the milk sold wholesale by farmers was marketed under the terms of the 56 federal milk market orders then in effect. More since have been added. The area in which federal milk orders operate extend from Boston to the Pacific Coast. They extend from the entire central area of the country from Duluth to New Orleans.

Why has the order program expanded so rapidly? In 1939 there were only 33 markets operating with federal orders. In February, 1956 there were 65. The Agricultural Marketing Agreement Act, which provides for these milk control orders, gives emphasis to such considerations as "purchasing power with respect to articles farmers buy," "protect the interest of consumers," "reflect the price of feed" and other economic conditions, "insure a sufficient quantity of pure and wholesome milk," and "public interest." No indication in the Act is given as to the weight that should be placed on these various objectives. Dr. Hoos indicated that economists have helped administrators in assigning weights. This is surely true with milk. Pricing formulas in use in many major markets were established on recommendations made by groups of economists.

Federal orders do not guarantee a given level of price—only a price related to other economic conditions. They do not guarantee farmers a market with any buyer. They do create orderly market conditions in which farmers can find a buyer for their milk.

First then the federal market order program has been growing because of the orderly marketing conditions they create. To do this they must use the classified pricing plan. This plan regulates handlers and assures that they pay a given minimum for all milk going into a given use. But it does not restrict competition among farmers in selling their milk.

Second it has been growing because in addition to creating orderly market conditions, federal orders have done a little more than that for producers. How much is very difficult to appraise. Many milk producers and surely their spokesmen believe that the Secretary of Agriculture has been placing too much weight on "insure a sufficient supply of milk" and not enough weight on the other criteria listed in the Act. Many feel that the Secretary has shown much more concern for balancing supply and demand for fluid milk than Congress has for balancing supply and demand for other commodities. Many feel that the Secretary should have gone farther in recognizing cost of production as "in the public interest." Be that as it may, I believe farmers have gotten something in addition

to orderly marketing. First, during the 1955 fiscal year the United States Department of Agriculture added eight additional market orders. This expansion in the use of milk marketing orders probably was the result of the generally heavy supplies of milk throughout the country, with consequent pressure on local marketing institutions. Most of the new orders were for areas which had been short of milk until modern transportation and handling methods permitted milk to be hauled long distances. The institution of the federal orders helped to stabilize local market conditions by requiring handlers and importers of milk to pay all producers of milk the same minimum prices subject to appropriate location adjustments. Second, there is evidence to support the conclusion that the state and federal milk control programs, in the northeastern states at least, have brought somewhat higher prices to producers. The effects cannot be measured accurately, but estimates prepared by Spencer and Christensen indicate that net prices to producers in the New York milkshed have been raised about 5 per cent by price-fixing programs.[1] Yes, federal orders have restricted somewhat competition in agriculture, but their primary effects have been to promote orderly marketing.

Let us now consider another type of control—state milk control. As of April, 1955, 16 states had milk control laws. Under these laws minimum producer prices are fixed in all or part of the state concerned. In addition, resale prices were set in 11 of the states having milk control laws. My belief is that federal policy has been to avoid requirements that might unduly impede the movement of milk. This has not been true of state orders generally. State officials responsible for milk control orders have generally shown little or no responsibility for the effects of their policies on national surpluses of milk products. They have shown relatively little concern for the criticism of high fluid prices that comes out of the midwest manufacturing area from time to time. They have, consequently, shown a regard for using their price-fixing powers for getting the highest price possible and less regard for the doctrine of supply-demand prices. On the producer side they have used, or have attempted to use, a variety of restrictive measures and policies, mainly to offset their inability to control the prices paid for milk produced in another state.

Furthermore, there can be little doubt that state milk control over resale prices tends to limit the opportunities for dealers to try out something new in the distribution process. Competition is on quality and service and not on price. By their very nature, the prices that are set and

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[1] Leland Spencer and S. Kent Christensen, "Milk Control Programs of the Northeastern States," Part 1. Cornell University Agricultural Experiment Station Bulletin 908 (1954).

the differentials for type of product, container or service, have given the control agency power to favor or discourage one method over another. The opportunities for introducing new innovations in marketing methods and practices are thereby severely limited.

DISCUSSION: CANADA'S PRICE SUPPORT POLICY AND ITS PERFORMANCE

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Mr. Turner has given us a very clear and useful picture of the Canadian system of price supports, and I personally want to thank him for it. In addition, many of us would like to congratulate Mr. Turner and his countrymen on Canada's restrained and generally sensible use of commodity price supports. We would congratulate them particularly on recognizing as a *mirage* the common, illusory view of identity between high price supports and farmer welfare. And we would congratulate them most feelingly on Canada's extraordinary degree of success in keeping her support operations flexible, in keeping those operations on a temporary, emergency basis, and in keeping them tied to the objective of promoting needed adjustments.

Canadian and United States Price Supports Contrasted

The contrast between Canada's generally wise use of agricultural price supports (minor deviations recognized) and our own unfortunate American record with such supports is most striking. Yet we do not have to hang our heads too low when talking to our Canadian neighbors. This contrast presumably does not reflect any great, superior virtue of the Canadian people, nor even the development of an improved breed of politicians on the other side of the international border. Rather does it appear to be intimately associated with the different economic structures of the two countries. Our Canadian friends *have* to deal fairly sensibly with their agricultural price problems, simply because agriculture is so very important to their national economy. Not only are Canadian farmers much more heavily dependent than American farmers on price-conscious foreign markets, but, in addition, the Canadian tax base is so much smaller than the American that the heaviest possible Canadian taxes would not go far toward financing the economically indefensible type of system of price supports and export subsidies that the United States is currently operating.

Differentiation Between Standby Price Guarantees and Price Supports

The striking contrast between the programs of agricultural price support of Canada and the United States points up the need for changing some of the terms and concepts now commonly employed in discussing national commodity price measures. Specifically, we need to distinguish between various governmental price controls that are superficially similar but fundamentally different—controls now indiscriminately lumped together under the term "price supports." Further, we need to recognize as true "price-support" operations certain governmental activities not presently so designated. Such distinctions would promote clearer thinking, more meaningful discussion, and better economic analysis.

Let me illustrate with reference to Mr. Turner's summary of Canadian price controls. In line with currently accepted terminology and also with the official title of the empowering Canadian legislation—the Agricultural Prices Support Act—Mr. Turner stated:

> "Support prices on hogs have been in effect each year since . . . 1950. However, the market price has remaind consistently at or above the support price all year . . . except 1952 when the United States embargo . . . was in effect . . ."

I would argue that the Canadian price guarantees for hogs, and also the Canadian Wheat Board's annually fixed "initial prices" for wheat, should be recognized as and called "standby price guarantees," not "price supports." The former term should likewise be applied to all other commodity price guarantees set well below usual real free-market price levels —guarantees effectively operative, if at all, only during short periods characterized by distinctly *abnormal* conditions, guarantees so flexible that they would be promptly reduced if the "abnormal" conditions threatened to become normal.

In contrast, the term "price supports" should be reserved for price controls that are truly, and more or less continuously, effective in raising producers' prices above levels that otherwise would prevail. Thus, not only American farm "loans" and loan-supported market prices for the so-called "basic" crops, but also the subsidy-supplemented prices received by American wool productrs, and the import-regulated or government-fixed prices of grain on German and Italian markets can all properly be referred to as "government-supported prices." I would add to this list also the Canadian Wheat Board's recent selling price for wheat, which has been persistently held above the International Wheat Agreement minimum despite the accumulation of a world wheat surplus of unprecedented magnitude. And we should add too some of the school lunch purchases of our own government. On the other hand, we should count as a *consumer subsidy*, not as a "price support," the $65,000,000 paid by the

Canadian Treasury to the five-year Wheat Pool of 1945-49, since that Pool had been deprived of far more than $65,000,000 by government-set ceiling prices on sales to domestic consumers and under the British contract.

The "standby price guarantees" as here defined, thus differ operationally from "price supports" mainly with respect to *level*. It is noteworthy that the *standby price guarantees* have little if any influence on average market prices over a period of years, that they require little, if any subsidy from taxpayers or consumers, and that they do not seriously overstimulate production nor reduce international trade or utilization as *support prices* tend to do.

In short, standby price guarantees, commonly referred to as "price supports," have virtually nothing in common with true price supports except, in some cases, their form. And it is the *level* of price guarantees, not their *form*, that is of primary economic importance. The form is of distinctly secondary significance, and then only because it may mean a different level of price to consumers or a different level in international trade.

This may be illustrated by our preference for the British system of deficiency payments to wheat producers, as contrasted with market price intervention. The British system has been framed so as to give domestic buyers (including millers) much or all of the benefit of any lower international prices that may exist. On the other hand, the same subsidy *form* might be introduced in the United States as a two-price system, with deficiency payments to producers based on an uneconomically high support level (parity or 90-per cent of parity) and with such a high associated milling tax that the effective price to American millers would be at or above the effective price to producers. Thus, whereas Britain's deficiency payment system has a favorable international effect (by increasing the import demand for wheat) a similar American system might mean increased, automatic export dumping, which Canada and Australia would find even more offensive than our present regulated, "back-door" dumping under Public 480.

Functional Classification of "Price Supports"

For clear thinking about national agricultural price measures, it is not enough to differentiate between "standby price guarantees" on the one hand and "price supports" on the other. The latter category remains too broad, including, as it does, a heterogeneous group of price controls that differ sharply with respect to their national and international economic effects.

Offhand, it might seem desirable to classify price supports for a com-

modity according to some scale of equivalent price *levels*. But although the level of a support price is of primary importance, it does not follow that international comparisons based on level are especially meaningful. For example, the present Swiss wheat-support price of over $(US) 4.00 per bushel has probably had less influence on the agricultural structure and wheat trade of that country than would a support price four-fifths as high in the United Kingdom or one barely half as high in Australia or Canada.

What is needed is a functional classification of national price supports —one that takes account of the economic effects of the different supports and, in addition, clearly distinguishes between measures pointed toward, and those not pointed toward, eventual discontinuance of persistent price intervention. Such a classification should prove useful to international agencies and committees trying to promote freer and fairer international trade, and to those trying to further economic solution of specific international commodity problems.

From an international standpoint, one can most usefully distinguish between three major groups of national price supports: (1) *temporary adjustment supports* that actively contribute to needed national and international adjustments by promoting a gradual transition from high price supports to "standby price guarantees" or uncontrolled market prices; (2) rigid *semipermanent supports* that actively and substantially interfere with needed international adjustments; and (3) *semipermanent supports* that may be disregarded because they have a negligible effect on international trade and international prices. It would seem reasonable to classify national price supports in the internationally approved "temporary adjustment" group only if they are administered so as to make cumulatively increasing annual contributions to supply-demand adjustments that will permit a shift to uncontrolled prices or "standby guarantees" within a specified period (say three to five years).

If international agreement could be reached on a classification of national price measures along the lines here suggested, the results might eventually be of considerable significance. In international agencies such as GATT, the UN Economic and Social Council, the FAO Committee on Commodity Problems, and the various International Commodity Councils, we should witness increased efforts to promote needed modifications of disturbing national price and trade programs. Indeed, we might even hope that the present misguided emphasis on *price stabilization* for individual commodities would be replaced by emphasis on commodity *price adjustments*, with increased reliance on general fiscal and monetary measures for national economic stabilization.

DISCUSSION: SHORTCOMINGS IN CURRENT EXPLANATIONS OF NATIONAL FARM SURPLUSES

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There is not much in this paper to which real exception can be taken—provided that one definition of a surplus be considered. However, two definitions are presented. They differ in specifying the basic questions engaged, in analyzing their determinants, and in identifying those which could be manipulated to achieve given objectives. It is sometimes difficult to decide which of the two definitions is at issue. Consequently, it is also difficult to appraise the validity of the diagnosis and the implicit suggestions for mitigation.

If a surplus be that part of a produced supply which is commercially unsalable at price levels directly or otherwise determined by support operations, the analysis seems tenable. Occasional surplus situations attributable to disparities in market position or to unforeseen and uncontrollable variations in yields or demand levels, or both, are not relevant here. The problem is then identified as undesirably large magnitudes of unsold stocks. This problem is not necessarily related to chronically low incomes.

At least over the last several seasons, such surpluses could not validly be attributed to general economic depression or instability, to weather, or to perversity of supply functions. Price support has been a major cause. Such supports may have induced expanded output both in supported commodities and perhaps in others interrelated in production or demand. This hypothesis is not clearly formulated by the author nor is it tested. Innovation in technology may also have been accelerated, but the concept itself is not defined operationally by the author, and there is no effective analysis of the assumed functional relationship between price support and rate of change in scale or method of production. Such support-induced changes may have been extended to products not directly supported. But again, the concept of accelerated technological change is not so specified that the implicit hypothesis of the author could be tested. Commercial sale may have been diminished. Demand for substitutes may have been raised.

The apparent policy objective in this specification of a surplus is elimination of commercially unsalable stocks or prevention of their production. Conceivably, such surpluses could be diminished by stringent limitation of inputs. However, acreage limitation has been defeated by changes in production methods and by diversion to other crops. Forced or induced deceleration of innovations could ultimately mitigate surpluses.

This kind of control would be almost impossibly difficult to achieve and might create dislocations less palatable than large and chronic surpluses. Government policy has long been directed primarily toward elimination of excess stocks. Dumping, supply limitation, and feeble demand-creation programs have been dictated by price support that really bites; that does, in fact, chronically maintain some domestic prices above the levels that would prevail without regulation; that does maintain prices in the protected domestic-plus-government outlet above those in other markets, the supply-response effects of which cannot effectively be controlled.

But surely, with this narrow definition of a surplus, there is no crippling difficulty in diagnosing causes or specifying remedy within accepted norms. If a surplus means no more than commercially unsalable production, it could be mitigated by lower supports, stringent supply controls, dumping, sales promotion, or a combination. There is little agreement on value norms to appraise surplus-generating programs or on alternative means to control them. There is neither ethical nor analytical compulsion for general acceptance of the values implicit in much of the argument.

However, the author also defines a surplus as prolonged production of a volume of output larger than that which would yield acceptable income levels in commercial sale. The question at issue, its determinants, and means for control differ sharply from the first and simpler definition. Here, there may be no commercially unsalable stocks. The question here is not how unsold stocks emerge or can be controlled. The question is why business enterprises continue to produce a volume greater than that which yields optimum net income. The objective is to lessen income disparities, usually with minimal decision making or noncommercial income transfer to farmers by government. Program operation requires definition of the net income variable, its determinants and the interrelations among them, and techniques to control the magnitude of one or more of the determinants.

Even assuming that existence of the implied net income disparity is precisely established, it is difficult to follow the appraisal of the author. Weather and the perverse supply function may again be eliminated as major causes. Price supports alone cannot be fully responsible, although they may accelerate "irrational" introduction of output-expanding technology. They may shrink some markets and induce higher supply of substitutes. But they do not explain sustained production of unprofitable aggregate output. And net income declines appear generally diffused rather than concentrated in products with unsold stocks.

The author implies that demands and input-supply functions have been fairly stable. Excessive production could then be commercially rational

if the income-receiving inputs had no better alternatives, if the income decline were merely apparent, if new methods or scale of production were inconsistent with optimum income for some or all producers but were adopted anyway by some unexplained process, if inputs of some or all income-receiving factors were excessive and mobility were difficult, or if disparities in market position of farm industries had worsened.

Again assuming that the income disparity has worsened, producers may have no better alternative. This hypothesis is not tested. There is no operational definition of "new technology" or its "assimilation," and the validity of this major argument cannot therefore be tested. Why should new technology continue to be introduced if it does not pay off? Why should the supply curve shift "far to the right more rapidly than the demand curve"? This is no explanation. It is merely a formalized and perhaps irrelevant description of a surplus of the second type. Did innovations make farm prices fall "relative to nonfarm prices"? If price supports induced premature tapping of a reservoir of technology, why have there not been adjustments toward equilibrium income levels? The primary difficulty in the paper appears to me to involve failure to define "new technology," to establish the functional determinants of its relationship to aggregate output, and to explain continued unprofitable innovation.

Other analysts have concluded that excess human inputs explain the chronic disequilibrium and that elimination of the excess would result in eliminating income disparities. This conclusion seems to rest on arbitrary and perhaps invalid application of elementary distribution theory, although the same mechanism could explain disequilibrium in terms of other factors quite as well. This static and disjunctive mechanism merely specifies the arithmetic of optimum income adjustments for firms under very stringent assumptions of data and relationships. It can yield back whatever answers are fed into it. Simple enterprise theory may be irrelevant to problems of sequential income disparities among heterogeneous but brutally aggregated inputs used in a nonstatic context in which market structures are changing.

But within this frame of arithmetic—relevant and valid or otherwise—the determinants of net income for any factor are specified. Thus, price support could conceivably raise marginal revenue functions. Higher productivity could do so unless offset by associated declines in product price. Under precisely specified conditions, reducing inputs could raise their net incomes provided that the entire battery of assumptions in the arithmetic prevailed in fact. This is not a satisfactory basis on which to analyze chronic surpluses or to prescribe remedial programs. The remedy

may be good, but its analytical justification is not. This paper is free of these difficulties, but it, too, leaves unexplained the chronic use of resources at less than presumed opportunity or acquisition costs.

There are a few specific statements that I cannot understand. Some dumping programs are called exports. Some are called "aggressive and ingenious." Some schematic descriptions appear as nominal explanations and are not. Most important, the determinants of sustained innovation inimical to net income are not satisfactorily explained. There are some value-loaded words. I don't know whether farmers really fail to share equitably in heightened productivity. I don't know whether they "deserve programs that protect them from the harsh forces of unbridled technological change" because I don't know what these words mean. I don't know what is meant by "assimilating without serious repercussions any technological advance." I don't know how to define "technology" operationally in order to test the author's major and perhaps valid hypothesis.

This paper handles the questions of unsold stocks and their disposal quite adequately. I feel less comfortable with respect to the analysis of persistent income inequality—in the statement of the question, its causes, and feasible remedies.

FOOD RESEARCH

Chairman: O. R. Johnson, University of Missouri

MAJOR CURRENT PROBLEMS IN NUTRITION RESEARCH

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THERE are major current problems in nutrition research—this in spite of 50 years of extraordinary progress.

In this period the list of indispensable amino acids has been completed with the recognition of tryptophan, methionine and threonine; the name vitamin has been coined and applied to more than a dozen newly isolated and identified nutrients; copper and other minerals have been added to the trace element group headed by iron and iodine; and one can record accomplishment after accomplishment in this fashion. Truly, this has been an era of great significance for nutritional health because it has brought about the virtual disappearance of the historically important deficiency diseases wherever the interest, understanding and material resources of populations have permitted.

There have been disappointments, too. In the 1920's, the observed effects of unidentified nutrients, known then only as vitamins A and C and D, on the development of dental tissues were responsible for the optimistic view that dental caries would soon be of historical interest alone. Thirty years have passed; and caries remains a very real and costly and painful affliction. It does not follow necessarily that there are not nutritional factors in dental disease. It does suggest that the influence of nutrients on teeth after their formation and eruption may have been exaggerated and that dietary considerations in infants during the period of development and calcification of dental structures may have been neglected. There can be no denial of the statement that a clearer understanding is needed of the relations of foodstuffs to dental health, whether or not the important considerations involve nutrients *per se*, physical texture of foods or control of oral bacteria.

The amazing increase in life expectancy in this country, attributable to improved sanitation, nutrition and medical science, has intensified interest in the phenomenon of growing old and in the so-called chronic diseases. It is doubtful if fundamental distinctions exist between nutritional requirements in middle age and in advanced age. Nevertheless, the incidence of arteriosclerosis, coronary thrombosis, hypertension and

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cancer has raised questions about the possible relation of these diseases to changing dietary habits.

Food consumption in the United States is significantly different from what it was 50 years ago. Most striking are the decreases in the annual per capita consumption of potatoes from 208 lb. in 1909 to 111 lb. in 1954 and of grain products from 309 lb. to 169 lb. in the same period. It is not believed that the eating of less potatoes and bread is the direct result of any nutritional finding because both foodstuffs are known by experience and by experiment to be desirable from a nutritional viewpoint. To try to make a case out of the obvious statistical correlation between degenerative diseases and decreased consumption of potatoes and grain products would be ridiculous, of course. There may be justification, perhaps, for examination of other possible relationships.

If one were to prepare a list of topics that are controversial in the area of food and nutrition in this country today, the problem of dietary fat would occupy a prominent position, partly because of its presumed relation to obesity and partly because of its presumed relation to arteriosclerosis and coronary thrombosis. Nutritionists have long accepted the "isodynamic law" that 9 calories from one gram of fat are interchangeable with 9 calories from 2¼ grams of carbohydrate. Demonstration of a dietary requirement in many species of animals for certain polyunsaturated fatty acids, arachidonic acid, especially, and linoleic acid from which it may be formed in the body, led to a modification of the application of the isodynamic law to diets by including the recommendation that 20 per cent, at least, of the total daily calories should be in the form of fats. A diet containing this amount of total mixed fat is believed to provide a satisfactory supply of polyunsaturated fats in most individuals. In addition to the probable dietary requirement of specific unsaturated fatty acids, contained in some but not in all fats, other factors, such as the beneficial effect of fat on the acceptability of prepared foods, the high caloric density of fat and the important role of certain fats as carriers of fat-soluble vitamins, as well as the practical matter of the wide occurrence of fat in commonly used foodstuffs, have been responsible for the current teaching that normal diets should contain significant amounts of fat.

In the United States food calories available from fat appear to have increased from 32 per cent of the total calories in 1909 to 41 per cent in 1955. Whether or not all of this represents "down the gullet" fat is questionable. Whether or not the entire increase may be ascribed to "down the gullet" fat or whether or not increased wastage of food fat is occurring is not known.

Of the 148 grams of fat per capita per day available for use as food

in 1955, slightly more than two-thirds, or 104 grams, was of animal origin. Nearly one-half of this portion, or 51 grams, consisted of fat from the meat-poultry-fish group, including pork fat cuts. Dairy products other than butter contributed 25 grams. Lard, butter and eggs furnished 12, 9 and 7 grams, respectively. Of the 44 grams of plant fats the principal forms were shortening, edible salad oils and margarines providing 14, 13 and 9 grams respectively.

During the last 25 years the consumption of butter has decreased 50 per cent and that of lard 30 per cent. At the same time there have been increases in the availability of dairy products other than butter, of items in the meat group, of margarines and of edible oils so that the actual ingestion of total fat appears to have been increased appreciably.

Pertinent questions are now being asked about these fat figures. Is the total amount of fat or is the distribution of fat between the various forms related in any way to nutritional status and, specifically, to arteriosclerosis? What is the optimum amount of fat in the diet? What kind of fat does the body need for most efficient performance? Astonishing as it is, positive answers cannot be given at this time. These are questions that demand early answers because of their physiological importance, to say nothing of the implications for agricultural economics. The nutritive quality of food fat cannot be defined in terms of grams of undesignated triglycerides. The plant or animal origin, the saturation or unsaturation, the presence of unnatural structural isomers formed by processing, hydrogenating or hardening procedures, the content of fat-soluble vitamins and the chemical nature of the sterols in the non-saponifiable fraction all introduce problems that may affect profoundly the nutritional adequacy of diets.

Experimental observations support the view that polyunsaturated fats, such as corn, soybean and cottonseed oils, tend to lower serum cholesterol levels and this is interpreted as decreasing the hazard of deposition of cholesterol in walls of blood vessels. Unanswered is the very practical question, "Do natural saturated fats or do processed fats increase serum cholesterol and, thereby, aggravate arteriosclerosis and coronary disease in the presence of reasonable supplies of polyunsaturated fats?" In other words, do saturated or processed fats have a positive, detrimental influence in the diet or are reported findings explicable wholly on the basis of a deficiency of polyunsaturated fat? The answers are not known.

Two additional factors, at least, complicate the problem of dietary fat and vascular disease. It appears reasonable to expect that the response to dietary fat may differ depending on the caloric adequacy of the diet. Evidence is accumulating but it is not yet sufficient to distinguish between the effect of a given quantity of a specific fat on the serum

cholesterol levels of those individuals who are maintaining their weights and of others who are slowly becoming obese. You will recognize how erroneous conclusions may be that do not distinguish between effects of dietary fat *per se* and the effects of excess calories, regardless of their source.

The second factor is the troublesome question of the role of dietary cholesterol. If one accepts as a demonstrated fact (and not all medical scientists do) a correlation between increased serum cholesterol levels and increased incidence of arteriosclerosis and of coronary disease, one must decide whether or not serum cholesterol is influenced by the ingestion of foods containing cholesterol. This is an important question because cholesterol is not found in association with plant fats. It occurs in all animal fats and in larger amounts in egg yolk and in butter. Adherents of the belief that dietary cholesterol is an injurious substance favor the exclusion of lard, eggs and butter from the diet. On the other side of the question are the facts (1) that the body can manufacture all of the cholesterol it needs, (2) that cholesterol is a normal constituent of every tissue and is a major component of brain and nerve tissue, and (3) that dietary cholesterol has relatively little effect on serum cholesterol levels. Adherents of the belief that dietary cholesterol is an innocuous substance claim that some other factor than cholesterol is the undetermined dietary culprit, with the finger of suspicion pointed at an insufficiency of polyunsaturated fats or at an excess of total fat or of total calories or even at a deficiency of a vitamin such as pyridoxine. We may shed a sincere tear of sympathy for John Public who is forced unhappily to hear some experts advise him on the alleged perils of his eating eggs and milk fat while other experts caution him to be sure these items are part of the daily fare of his children!

Although the medical and economic importance of these question is obvious the solutions will not be found easily because of the difficulty in obtaining reproducible and unequivocal data from studies on large numbers of human subjects. The importance of the questions, nevertheless, demands vigorous research activity along these lines. The paucity of basic information about the nutritional aspects of the kind and amount of fat in our diets is emphasized because of the dogmatic and conflicting declarations made by sincere and responsible scientists. We need more facts, not more invitations to extreme views.

Fat is the normal storage form of energy in the animal, including man. Elaborate enzymatic and hormonal mechanism control its chemical transformations in the body. There is much evidence in support of the view that its intermediate products serve as the primary fuel of resting muscle. It is synthesized by mammary tissue and, thereby, becomes an important foodstuff of the young. In well nourished individuals it is probable that a

significant portion of the dietary carbohydrate becomes tissue fat in the intervals between meals. In overfed individuals dietary carbohydrate may be the principal source of disfiguring adipose tissue. Fat, then, becomes an ugly word only as it appears in excessive amounts in the obese.

Obesity in most instances is the result of thoughtless excessive indulgence in food. Limitation of body weight to the weight at 30 years of age is greatly to be desired in adults and this can be achieved by dietary self control. These points are emphasized because current instructions in many instances advocate the eating of low-fat diets without indication of the desirable, and, possibly indispensable character of certain fats. The uninformed may readily select diets that may be too low in sources of arachidonic and linoleic acids, assuming that these are essential in man. This is possible even if the recommended 20 per cent of the total calories is consumed as fat, in this case as saturated or hardened fat.

It would appear more reasonable to select one's food on normal or on reducing diets from those foodstuffs shown by experience and by experiment to be desirable nutritionally.—As Voit stated it, it is prudent to consume food in such quantity and in such proportion as to least burden the body.

It is of interest to inquire if the changes in the amount and type of fat in the American dietary are related in any way to nutritional findings. Certainly, we need to be more certain about the fat consumption data. As you know, most of our figures are "disappearance" figures and these without question include a sizeable wastage of cooking fat. However, if an increase in the proportion of fat in our diets has occurred, it is not believed to be the result of the deliberate planning of public health nutritionists, except as increased use of calcium-rich dairy products and protein–and vitamin-rich meat products has been urged. Similarly, I am not aware of nutritional findings that may account for the changing pattern of distribution of dietary fats. There is no obvious nutritional reason to expect or to urge an increased consumption of total fat. It remains to be demonstrated that the present intake is too large. There is nutritional reason to urge that more care is taken to insure an adequate intake of polyunsaturated plant oils. Because the evidence is still incomplete, no statement can be made about the quantitative aspects of the possible requirement of arachidonic and linoleic acids by the adult. It appears fairly certain, however, that the present per capita consumption figures provide more than adequate supplies of total fat. It remains for further studies to decide if too large a proportion of the daily calories are in the form of fat and if processing procedures influence responses to the diet. It is safe to assume that efforts to bring about a more uniform consumption of unprocessed plant oils may be necessary.

There are no major problems concerned with the use of carbohydrate

as a food with the exception of over-consumption of total calories and the possible deleterious effect of fermentable sugars in favoring the activity of acid-forming bacteria in the mouth. Substitution of non-nutritive, non-caloric sweetening agents for sugars has been proposed as an aid in the prevention of obesity and of dental caries. The chemical sweeteners are useful to those who must limit the consumption of sugar, such as diabetics. Their use has no direct influence on obesity unless it is as a part of a definite program of reduction of the total calorie content of the daily food. Any serious plan to control dental caries by replacement of sugar by a non-nutritive chemical should not be undertaken unless more certain evidence is obtained that the decay of teeth cannot be prevented by making it possible for more acid-resistant teeth to be formed through proper regulation of the diet at the time of calcification and of eruption.

Protein nutrition has had a unique attraction and fascination for biological scientists because protein is the only one of the three major foodstuffs which shows the phenomenon of balance or equilibrium between intake and excretion in the adult animal. The carbons of carbohydrate and fat, if in excess in the diet, remain in the body as new adipose tissue; in contrast, the nitrogen of the amino acids of protein is excreted in proportion to its consumption and without regard to the extent of its oversupply. This peculiarity has raised the question of the advantage or disadvantage of an abundance of dietary proteins. What is an abundance? What is an optimal intake? Is the source or the nature of the protein a factor to be considered? Are the beneficial qualities of protein a property of protein itself or do they reside in one or more of its constituent amino acids?

The arguments for low and for high protein intake cannot be repeated at this time other than to note the contrasting statements of two well-known physiologists of a previous generation, Chittenden and Voit, who described a high protein diet, respectively as "harmful self-indulgence" and as "the right of civilized man." Evidence for the essential character of protein foodstuffs is convincing and noncontroversial. The indispensability of protein is recognized by failure of growth in the young, by decreased blood plasma proteins, by anemia and by general weakness and wasting of tissues. So-called negative nitrogen balance measures the breakdown of certain body proteins to permit the building of other more important nitrogenous compounds. These indications of the vital role of dietary protein in nutrition are not merely laboratory findings under artificial experimental conditions, for one of the most serious and widespread nutritional deficiencies known in the world today, kwashiorkor, is now recognized as due to a lack of proper dietary proteins.

Is it to be concluded, then, that there is no aspect of protein nutrition

that is a major current problem in the United States? By no means is this true, because major questions still remain unanswered.

The daily allowance of protein recommended for an adult man by the Food and Nutrition Board of the National Research Council is one gram per kilo body weight, or 60 to 80 grams daily. This amount represents a consensus of experience and experiment. It includes a reasonable overage beyond minimum requirements to provide a fair factor of safety. It presumes a varied source of protein foodstuffs including some of animal origin. The practical value of the recommendation of a gram of protein per day is unquestioned. Nevertheless, it would be useful to know with certainty whether the level might better be 0.75 grams or 1.25 grams per day. So small a difference as 0.1 gm. in the recommended daily allowance per kilo represents a variation of approximately 300,000 tons in the yearly consumption of protein in the United States. This is the protein equivalent of 10,000,000 tons of milk, a significant quantity even in this country.

Particularly important is the question of the biological value of individual proteins. It is possible to attain nitrogen balance in the adult with lower intakes of some proteins than of others. Higher biological value is the result of a better proportion of the indispensable amino acids in the protein. Generally, the quantitative distribution of indispensable amino acids in animal proteins is superior to that of plant proteins. The important question then arises, "Assuming that each level of intake assures the same supply of the limiting essential amino acid, are 60 grams of animal protein, for example, the daily equivalent in nutritive value of 80 or 100 or 120 grams of plant protein, no better and no worse?" Is the extra, dispensable nitrogen of the plant protein in this instance neither useful nor detrimental? These are important questions that cannot be answered with complete assurance at this time. The questions are important, too, because it is certainly not an over-statement to say that we should be as exacting in the specifications of our foodstuffs as of the fuel of our automobiles.

Many food economists and nutritionists foresee the future supplementation of protein foodstuffs, particularly those of plant origin, with the amino acids, which will yield a total mixture simulating that derived from sources of protein of high biological value, such as eggs, milk and meats. Lysine is the limiting amino acid in the wheat proteins. There is no question but that the biological value of wheat protein is markedly improved by the addition of this amino acid to diets limited to wheat as the protein source. This understandable and highly important observation is of great potential significance but it should not blind us to the fact that further investigations of the matter are necessary. In this particular instance an increase in the lysine content of the food effects a major benefit but al-

most innumerable questions remain to be answered regarding supplementation with other amino acids, the influence of rates of absorption in the small intestine and the efficiency of diets comparable in respect to essential amino acids, but differing in their total nitrogen content.

Fortunately, natural foodstuffs provide mixtures of proteins that commonly supplement each other in nutritive value, i.e., the relative shortage of sulfur amino acids in the casein of milk is inconsequential because of the relatively rich supply of these acids in lactalbumin. Many experiments have demonstrated the soundness of the conclusion that the biological value of mixtures of proteins may be improved by selecting those that together yield the amounts and proportions of amino acids best suited to the requirements of the individual.

The occurrence of kwashiorkor in many parts of the globe is in itself evidence of a lack of a sufficient supply of protein foodstuffs to permit an adequate intake of protein, even of protein of only moderately good biological value. Because global enrichment of low grade proteins with amino acids is not economically possible the search continues for natural proteins that may be combined to yield edible mixtures of high biological value. This is a very real problem in spite of its apparent unreality in a country blessed with large supplies of animal as well as of plant proteins.

For ourselves, is enrichment of flour with lysine necessary or desirable? Opinions vary on this point but there is merit in the recommendation to avoid artificial fortification of common foodstuffs except when there is a demonstrated physiological need. Nutritionists are not aware of protein deficiency in the United States comparable to the earlier signs of deficiencies of thiamine, riboflavin and niacin that led to the present enrichment of flour with these nutrients. Available protein of fairly high biological value has amounted to nearly 100 grams per capita per day for at least 4 decades. Even after allowance for considerable wastage, the amount is satisfactory. There is no nutritional reason for advocating a larger per capita consumption of protein in the United States. As in the case of the polyunsaturated fats, there is always the problem of assuring a uniformly satisfactory consumption of this foodstuff.

It is relevant to ask if a greatly increased production of the protein foodstuffs, meat, eggs, non-fat milk solids, and legumes, should be urged for export to countries in which protein shortage exists, as evidenced by the high incidence of kwasiorkor and other diseases. It is easy to answer in the affirmative but, this should be done only as part of a program that has given full attention to problems of food habits, of transportation, of storage and of interest on the part of the importing governments.

A problem that is unavoidable in a country having a vigorous and successful program of food technology is the need to keep biological test-

ing on a par with technological advances to insure the safety and nutritive quality of the food marketed. Experience has demonstrated the usefulness of the majority of technological developments. They are to be commended and encouraged. However, it is believed a sound public health precaution to determine the effect of chemical modifications in foods and, especially, to be aware of and to control chemical additives in foods that result from the use of soil improvers, from pest control agents and from processing procedures.

In conclusion may I refer to the problem of increasing the general "know-how" about foods and nutrition. Misinformation runs from one extreme to another, from belief that agricultural crops grown on chemically fertilized soils are without food value to unquestioning acceptance of the latest fancy in reducing regimens. A unique and disappointing illustration of human weakness in the latter respect is the Pied Piper exhibition furnished recently by followers of a low-protein reducing regimen bearing a well-known name and publicized in a popular magazine. It remains to be seen whether or not serious harm has been done by the prolonged use of this bizarre diet.

Such an episode emphasizes in a striking manner the very real interest that exists in food in this country. Whether or not this is the result of efforts of the producers and processors of food, of public health nutritionists or of the necessity of not out-growing one's clothes, the interest is real and is in addition to the instinctive drive to eat to survive. Could it be that one of our major nutrition problems is our own failure as educators to capitalize on that interest so as to increase sane and good "know-how" about foods and nutrition?

STUDIES OF THE CONSUMPTION OF FOOD AND THEIR USES

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FOOD consumption has been studied in many ways, varying from a survey of one week's purchases of a single food by a small number of families in one community to the heavy statistical tomes by Henry Schultz and J. R. N. Stone. In this paper I can only survey the wide range of food consumption studies by considering, first, the objectives of such studies; second, available basic data pertaining to the consumption of food in the United States; third, the kinds of problems encountered in studying food consumption patterns and trends; fourth, how findings from studies of consumption patterns and trends are and can be used. Finally, I shall make some personal observations on major needs for food consumption data and analyses.

The primary objectives of studies of food consumption are often not identical with the actual uses to which their results are put. I can identify five major objectives: (1) To describe current and historical patterns and trends in food consumption and to find out how well fed people are. (Examples: Consumer Purchases Study of 1935-36 and AMS work on per capita consumption.) (2) To determine factors affecting food consumption patterns and trends, including basic socio-economic factors such as income, price, region, city size, and to appraise the effects on consumption rates and prices of policies and programs of private and public agencies such as rationing, price restrictions and supports, advertising, to mention but a few. (Examples: Market development and price analysis work.) (3) To gauge future trends in consumption and potential demand for farm commodities, for marketing services sold with food, and for foods as purchased by consumers. (Examples: *What Peace Can Mean to American Farmers*, USDA Misc. Pub. 512, and "The Long-Run Demand for Farm Products" by Rex F. Daly in July 1956 issue of *Agricultural Economics Research*.) (4) To develop and test hypotheses about consumer behavior and demand. (5) To try out statistical techniques, often with the secondary objective, as in preceding objectives, of obtaining advanced degrees and other academic laurels.

Here, as at many other points in this paper, I regret that there is time only to survey the area, not to chart it in detail.

Review of Available Data

For this country we now have a large variety of data available for analysis of food consumption patterns and trends. We often can choose among

sets of data that differ significantly as to source of the reports, level at which consumption is measured, and time periods covered. If we keep in mind who reports the quantities, prices, or dollar values of foods moving into consumption, we can do a better job of allowing for biases in normal years and for the unusual developments of abnormal periods. Sets of data on price or consumption or marketings as measured at the farm level, at wholesale, or at retail differ in economic implications and can be substituted for each other only with adjustments or approximations that may affect the end results of the analysis. Available sets of data differ also as to time periods; some are annual series (in weighted or unweighted combinations), some represent continuous reporting or sampling through the year, others cover one week only. The length of time periods frequently affects the elasticities derived. Upon reflection, you will undoubtedly agree that the pet assumption of economists "that other conditions remain the same" rarely applies. So we are in the deep water of economic dynamics before we've learned to swim in still shallows.

Consumption data have often been classified into two types, time series, and cross section or family survey. I find difficulty in applying this classification so I shall mention specific sets of data to remind you of the kinds of data available for use.

I begin with the official estimates by the Department of Agriculture of *annual per capita consumption* for more than a hundred food items.[1] These estimates of apparent consumption are developed from "disappearance" data in the form of supply and distribution tables, sometimes called "food balance sheets." The per capita data may be visualized as measuring the flow of food commodities from U. S. farms, imports, and stocks in specified positions into distribution for civilian consumption. Being a reasonably adequate measure of net changes in over-all consumption, they provide the framework within which we can fit other types of consumption data to study the details of changing patterns.

The Department of Commerce series on *food expenditures* is computed as part of the Department's work on national income. This series represents, in general, the total market value of food sold to final consumers and consumed on farms where produced. Whereas the per capita and total disappearance data are series of quantities, the expenditure data can be viewed as the total market value of food, that is all quantities of food of all qualities times the prices at which they are sold to final consumers. Because the data cover both food sales and meal sales by restaurants, they include the value of marketing services sold with food.

[1] Described and compiled in Agriculture Handbook No. 62 *Consumption of Food in the United States, 1909-52* and its *Supplement for 1954*. Current figures are given in the AMS quarterly publication, *The National Food Situation*.

Other sets of data pertaining to food consumption are the series on *retail cost and total market value* of food produced only on American farms and consumed by U. S. civilians.[2] Most of you will recognize this body of data by the terms "national marketing bill," "price spread," and "farmer's share," which describe parts of it. In the past 2 or 3 years Kenneth Ogren and I have been developing two series, one the total market value of just domestically produced farm foods, the other, still unfinished, the total market value of all foods, including imported foods and fish. Once we have built up the aggregates for all commodities from USDA statistics on farm sales, price spreads, the food disappearance data and other material from censuses and market surveys, we are able to identify and measure changes in the components of expenditures for food. Eventually it will also be possible to integrate the pyramiding mass of market cost data so that they can be used to analyze the consumption of marketing services bought with major categories of farm food commodities, not just all food combined.

One-time surveys of household food consumption supply cross-section data on patterns of family food consumption, grouped by income, geographical area, and degree of urbanization, for example. These usually cover one week's use or purchase. The nationwide surveys of household food use yield some of the benchmarks we need for tracing changes in the structure or patterns of U. S. food consumption. They provide the same sort of anchors for consumption data as the censuses of agriculture, manufactures, and business do for production and distribution data. These surveys shed light on important relationships between consumption and socio-economic factors. The missing benchmarks are those for estimating consumption of individual foods away from home—as in eating places and institutions.

Panel or repeated surveys have operated in limited areas or with limited commodity coverage, as the Michigan State University survey at Lansing and the private panels of research firms. Such panels are valuable sources of cross-section information through time on the consumption of items with shifting patterns or consumption rates in periods with unusual socio-economic developments. They also supply basic information on relationships that underlie food patterns—such as complementarity and substitution, changing consumption characteristics of particular family types, and so forth.

In recent years there have been many surveys of the consumption patterns of population groups known to have dietary problems, of people in areas of particular importance to some marketing firm or public agency,

[2] See the two articles by Kenneth E. Ogren in *Agricultural Economics Research* of October 1955 and April 1956.

and *special surveys of use and preference* for particular commodities by industrial users, household consumers, or distributors. Such surveys yield information on how goods flow from producers to consumers, on who uses the surveys, and, sometimes, on why they do so as revealed by their opinions about products on the market. Such surveys are generally used to supply quick answers to specific questions, but eventually we may be able to tie them in with studies of consumer expectations and observations of past consumer behavior to obtain the leads needed for forecasting unusual changes in consumption patterns. The use of consumption and preference surveys as part of controlled experiments appears to me to offer what economic researchers have long desired to compare with laboratory experiments in the physical sciences.

Many marketing analysts use information relating to consumption obtained by *retail store experiments* for the study of the demand for marketing services and for appraisal of merchandising methods. Likewise, data on movements of commodities from retail stores are valuable current indicators of changes in demand within the limitations of their design.

Problems Encountered in Studying Consumption Patterns and Trends

The first hurdle in studying food consumption is to decide if our problem requires us to measure food consumption in terms of quantity, quality, or value and if the measurement should be at the farm or at some level in the marketing process, or in the consuming household or institution.[3]

Difficulties with definition and comparability seem to be magnified for consumption analysts because so many of our important series are rough byproducts of other statistical operations. Also just ask your neighboring economist here in the hall and your wife what they understand by the common phrases "quantity of food consumed" and "expenditures for food." You will find that they have several ideas, probably rather different from your own.

There are also the usual statistical problems arising from changing or inadequate coverage, sample design, and statistical biases.

Next there is the problem of combining data on individual foods as heterogeneous as meat and frozen fruit juices. Such combinations are really indexes. Although we all learn something in elementary statistics about the significance of weights in index number construction, econometric literature contains many direct comparisons of price and income elasticities of demand derived with very different weights and at very different stages in the marketing process. The first step in combining data

[3] For further development see the article "Problems in the Analysis of Food Consumption," *Agricultural Economics Research*, January 1954.

on several foods is to examine carefully the uses to which the combinations are to be put. When we consider the deceptively easy combination of foods in terms of pounds, we realize that the addition of pounds of meat, pounds of flour, and pounds of frozen orange juice gives us a total without economic meaning.

Combinations based on value, that is prices times quantities of food consumed, reflect inputs on the supply side and preferences on the demand side. When we are interested in demand at the farm level, we work with farm prices and farm weights. When our interest is in consumer demand, we work with retail prices and retail weights.

There are a number of different ways to combine foods on a value basis. We can add up cash receipts of farmers for food products, or sales to consumers by farmers, wholesalers, and retailers, or we can compute equivalent retail values over a series of years using changing quantities consumed and changing prices. These data are very useful for certain analyses but the user must beware of hidden changes in relative prices and in quality, and, when using total market value or expenditure data, in services sold with foods.

For much of my work on the study of changing food patterns I have found quantity indexes weighted by constant prices to be more useful and understandable than indexes of combinations on other bases, but I always have an uneasy feeling about the implications of fixing the price relationships.

Caloric value seems to offer an enchanting way to combine foods.[4] Although calories are probably significant for countries with rather low levels of food consumption, I don't see that they provide a useful common denominator for most economic analyses because caloric content is not an indicator of agricultural or marketing inputs or consumer preference.

Other problems in consumption and demand analysis arise from our choices of data on economic and social factors for use with data on consumption patterns and trends. For example, I consistently underestimated the rise in food prices for some months after price controls were removed in 1946, principally because I was relying on disposable income per capita as the measure of total consumer purchasing power. Later on, I came to realize that current income was being substantially supplemented by use of liquid assets such as war bonds. This illustrates the need for clear understanding of the factors that affect food consumption and prices and for careful choice of data to match.

Also, we have to concentrate on the most important of the economic and social changes that are taking place over time. Certainly family size

[4] See L. Juréen, "Long-term Trends in Food Consumption: A Multi-Country Study." *Econometrica*, Vol. 24, No. 1, pp. 1-21, January 1956.

and composition, for example, affect family expenditures for food. These factors may be changing so little, however, that they have much less significance for changes in food consumption and food expenditures than do changes in the market structure for food. Here I am thinking of such changes as reduced home production, distribution of income, technological changes in marketing and shifts in market channels, increased urbanization of our population, and greater emphasis on buying services with food now necessary because of the way we live.

Although I suspect that most of us encounter some difficulty in applying available statistical techniques or tools to consumption data, I shall not go into such problems as they are related to another discussion on this program.

As a compiler of data on food consumption, however, I always feel called upon to warn against reliance on overly refined methods applied to rough data. The results of such analyses may be not only useless but misleading for less sophisticated researchers and for people who pick up coefficients the way a Bowery bum picks up cigarette butts.

Finally we come to the most tantalizing problems—those arising from attempts to use in a single analysis two or more sets of the consumption data mentioned previously. This is the area in which we are likely to see great progress within the next few years, as more analysts become thoroughly familiar with the characteristics and potentialities of our growing mass of consumption data.

In the last 10 years several studies have combined time series and family survey data. For example, Tobin used an income-elasticity coefficient derived from 1941 urban survey data on food and alcoholic beverage expenditures (excluding data on highest income group) as a substitute in his reduced-form equation for an income elasticity of the quantity of food consumed per capita by the entire U. S. civilian population in the years 1912-1948, as measured by the BAE index of civilian per capita food consumption.[5]

Such a combination ignores conceptual differences between food expenditures and quantity of food consumed. And it disregards differences between static and dynamic situations arising from major shifts in rural-urban distribution of the population, some rather abnormal price and income relationships in the survey year, and many changes during the last 35 years in food marketing technology and structure as well as changes in the way Americans live.

Such efforts to cope with the identification problem of demand analysis by combining family survey and time series data are to be commended

[5] James Tobin, "A Statistical Demand Function for Food in the U.S.A." *Journal of the Royal Statistical Society*, Series A, Vol. CXIII Part II pp. 113-149. 1950.

for their industry but to be condemned on conceptual grounds. They have some of the characteristics of jerry-built houses on shifting sands. They do have some merit in providing temporary shelter while we proceed to build tighter houses on firmer ground. You will find that Klein has reviewed such efforts and concluded, "The pooling principle is admirable. . . . Most applications are not properly formulated in terms of structural estimation."[6]

In the last few years I have worked on a comparison of income elasticities derived from several sets of time series data and from several surveys of food consumption and expenditures. The variations arise partly from major conceptual differences and partly from statistical difficulties. Although I have not yet developed the necessary measures, I believe that it will be possible to appraise the effects of each of the following: (1) statistical difficulties in reporting and coverage inherent in both sets of data, (2) changes in the distribution of income, (3) several types of changes in the food supply situation during the last 25 years that have no counterpart at any one point in time, (4) unusual differences in the consumption rates of high and low-income families that may arise from the particular supply situation of the short period of the survey,[7] and (5) gradual changes in the demand for food and for food marketing services that are basically unlike differences between such demands of high-income families and those of low-income families at a given time.

Applications of Findings from Consumption Studies

Although many of you have used consumption data of one kind or another, a quick survey will remind you of the variety of such uses–first, short-run forecasting of consumption and prices as in the situation and outlook work of the state colleges, the U. S. Department of Agriculture, and private agencies; second, longer-run forecasting of consumption and demand. As Working and Foote have indicated,[8] price analysis research now in progress is not likely to be directly useful for long-run forecasting of demand because it does not illuminate the factors that influence consumption over the years. Our less formal research on consumption patterns and trends has enabled us to prepare projections of possible con-

[6] Lawrence R. Klein, *A Textbook of Econometrics*, p. 237, Row, Peterson and Company, White Plains, N.Y., 1953.

[7] Harold Breimyer has developed this idea from his experience with meat consumption data.

[8] E. J. Working, "How Much Progress Has Been Made in the Study of the Demand for Farm Products?" *Journal of Farm Economics*, Vol. XXXVII No. 5, pp. 968-74, Dec. 1955. Richard J. Foote, "Price Elasticities of Demand for Nondurable Goods, with Emphasis on Food." Paper presented at Conference on Consumption and Economic Development, Universities–National Bureau of Economic Research, Committee for Economic Research, Oct. 21-22, 1955, AMS-96, March 1956, processed.

sumption (and supply) of farm products under alternative economic conditions. Wells and Cavin have described and summarized these efforts.[9]

The accuracy of our shots on projecting food consumption rates must be judged only after taking account of the validity of the assumptions or projected economic framework. Although no one has performed a complete post mortem, we have checked the figures enough to admit that our record isn't anything to brag about—except that we came closer than the postwar alarmists who were looking backward rather than forward. We still are raw recruits firing imperfect guns at small targets in a dense fog.

We have to keep firing away because the needs of agriculture, of marketing agencies, and of public organizations are pressing for even rough indications of changes in food consumption patterns and their net effects. Here again, I have time only to mention some of their requirements. Farmers and those who advise them need the information on food consumption patterns and trends as well as on related price data to aid in adjusting total resources allocated to farm outut and in shifting such resources among commodities to meet domestic and foreign demand. Findings from consumption studies should be helpful in indicating desirable improvements in quality. When we know more about food consumption, we should be able to provide farm groups with reliable answers to such a question as this: How will the demand for farm commodity "X" be affected by particular types of changes in major socio-economic factors such as supply and price of substitute commodities, distribution of income, size of family, age of population, or degree of urbanization?

In this country, marketing agencies are relying more and more on the findings of consumption studies. Many sales managers use consumption data to allocate sales quotas. Merchandising departments use them to prepare copy and to plan campaigns. Other firms and organizations go more deeply into the trends in demand for farm commodities and for the marketing services they sell. They find such information valuable in allocating their productive resources among commodities and among their price lines or their particular types of services, and among areas of the country. Some even use consumption data to orient their technological research.

Public agencies have well-publicized needs for findings on food consumption. Many members of our association have intimate knowledge of their use for public information programs, for easing the strains of production-consumption adjustments by means of subsidies and restric-

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[9] Oris V. Wells and James P. Cavin, "Long-Range Projections of Supply and Demand Relations for Agricultural Products." Paper presented to Association of Southern Agricultural Workers, Louisville, Kentucky, February 1955. Full working draft available from authors, summary published in *Proceedings of Marketing Section.*

tions, and for planning and administering subsidies to particular population groups to maintain health and to permit a minimum level of living. Consumption studies received major impetus from demands of wartime agencies and now from the organizations responsible for defense emergency planning and administration. Peacetime needs are increasing for consumption data and analyses to direct such major public investments as dams, international loans, and food research.

Major Needs for Data and Analyses

Although I think that as of August 1956 we have greater need for analysis than for data in addition to the flows now under way, I shall first give my own ideas about our needs for data.

The most pressing need for data is a nation-wide survey of food use by eating places and institutions, with area and type of firm breaks, to serve as a benchmark for new statistical work on the demand for all foods combined and for major commodities.

Second, to meet emergency needs for food consumption data (which by definition we cannot predict), I join many economists in public agencies in wishing for at least the skeleton of a continuing survey collecting socio-economic data including information on expenditures for major foods each month or every quarter.

Third, we need measures of food wastes and losses, and nutrient losses in marketing channels, in food preparation, and in actual consumption. We who are responsible for estimating civilian food consumption are well aware of the inadequacies of our rough adjustments in the data from the level at which we measure the flow of each commodity to approximate disappearance at the retail level. We are not as perturbed as are many people by the differences between the resulting estimates of available supplies of nutrients and the NRC recommended dietary allowances. In part, this reflects too long exposure to the roughness of our adjustments, realization of costs and survey difficulties of tackling the job directly, knowledge of the gradual collection of valuable bits and pieces of information as byproducts of marketing and nutrition studies, and, not least, awareness of the lack of precision in the dietary allowances themselves and the limited significance of comparing averages when dispersion is the measure of needed improvement in nutrition.

Fourth, information on differences in food consumption rates within families or within consuming units would help us to do a better job of forecasting the demand for food, as well as estimating food requirements for emergency periods. At present we don't know how to adjust our average rates of consumption to allow for, say, more teenage boys or more elderly people in our population a decade from now, because we have no

direct measure of how their consumption differs from the average. From the 1955 Survey of Household Food Consumption we will be able to calculate some rough estimates of these differences but only by making some critical assumptions.

Fifth, as a preliminary to improving our demand analyses, there needs to be much more information on the process of consumer choice making for foods. Before a body of useful data can be collected, the theory of choice needs revamping, in my opinion, and methodology for collecting data on alternative choices must be further developed. Such work can be fruitful only if survey specialists are permitted wide scope for experimentation with intensive and extensive studies of preference and use. Even though we must recognize that we will never be able to develop a perfect or fixed set of coefficients for our forecasting equations because of constant changes in the complex of socio-economic factors, I am convinced that we can do much to improve our guns and to dispel some of the fog.

My last suggestion relative to requirements for U. S. data on food consumption is that we need to make a start toward coordinated and integrated gathering of facts on food distribution, consumption, nutrition and health as well as joint analysis by researchers from several disciplines. I believe that we could obtain valuable insights into matching up several kinds of data and analyzing them if we practiced on a coordinated pilot study of the whole structure of food marketing and consumption in just one community. One plan for such a study has been tagged "Food Middletown."

Problems in Analyzing Food Consumption

The following seem to me to require urgent attention:

(1) Exploration of inflexibilities or stickiness in consumption patterns. These result in uneven reactions to changes in price, income, market availability, and even nutritional knowledge.

(2) Will current trends in per capita consumption rates for some foods eventually stabilize? If so, at what level? Can we forecast or alter such asymptotes? We cannot answer such questions until we learn a lot more about how to study alternative choices.

(3) How far will the apparent trend go toward homogeneity of food consumption patterns, as for example, between North and South, urban and rural?

(4) How can we analyze the economic aspects of quality of food consumed without undue reliance on prices as indicators?

(5) Also, we face difficult problems in the analysis of the demand for marketing services bought with food. We should work up useful measures

of their "consumption" and we need to gauge the effects of marketing changes on the demand for farm commodities as such.

(6) Isolation of effects of major economic changes such as industrialization, urbanization, and technological changes in marketing and then learning how to allow for variations in rates of such changes.

(7) At very high levels of real income such as we may experience in the next 20 to 25 years, other forces than income and price may become predominant in directing food consumption patterns. Even now some of us are wondering how far income is really a "catch all" for other economic factors that we fail to identify separately.

Theoretical Framework

Perhaps more important than our needs for data and analyses is the need for a fresh look at our theoretical framework for studying food consumption. Here I am thinking of demand schedules, marginal utility theory, and modern indifference theory as they bear on choices and the dynamics of food consumption. From a review of contemporary studies of food consumption and conversations with people who work on food consumption in a number of European countries, I am of the opinion that the current theories of consumption and demand fail to perform satisfactorily their functions of enabling us to understand the facts of food consumption. I suspect that we have put too much effort into making the facts fit outmoded theories. Herman Southworth appraised our progress in developing a set of principles in the area of consumer behavior at these meetings two years ago. To his findings I can only add at this time that Professor R. B. Braithwaite of Cambridge is developing principles of choice making from a less mathematical application and broader interpretation of the theory of games. This development may provide the basis for a dynamic theory of consumption and demand.

SOME PROBLEMS RAISED BY THE OFFICIAL ESTIMATES OF AMERICAN PER CAPITA FOOD CONSUMPTION

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WHOEVER looks into a publication of the United States Department of Agriculture entitled *Food Consumption in the United States, 1909-52* will find in it almost inconceivably detailed statistical information pertaining to national use of food, annually from 1909 to 1952; and from supplementary documents, one can have data for later years too. These give a basis for attempting first to describe and second to explain changing patterns of national food use over as long a time as I could manage. The descriptive statistical work has probably proceeded nearly as far as is necessary. On some matters of interpretation, and particularly the buttressing of hypotheses with statistical evidence, I am still groping. Six summary tables of the basic descriptive statistics have been distributed. I shall focus here upon some but not all of the problems both of measurement and of interpretation of long-term trends. First I shall mention problems of definition and coverage; second, problems concerning relative levels and trends of ingestion and noningestion; third, problems of backward projection; fourth, problems of the causation of changing proportions; and fifth, problems of forward projection.

I

In these six tables, the numbers aside from percentages refer to "calories per person per day." These, except for the column called "all foods" in the first table after 1909, are not to be found in the official publication. After 1909, they are figures calculated from data on pounds of food per capita per day given in the official publication taken in conjunction with figures, some kindly furnished by the Department of Agriculture, on calorie content per pound if not of each, then of every important, food among 218 or so food items that are covered by the official estimates. All figures prior to 1909 I have built up from other data than appear in the major official publication referred to above.

If I am to talk about all food and how its constituent parts change, I prefer to talk about the only meaningful common denominator of food one can have, aside from value; and that is the calorie content, since weight is meaningless because so much of the weight of food is water and that is not food. The Department has prepared for years since 1909 what it calls an index of all food consumed annually per capita. This is really an annual index of the value per capita at constant price of all food available in the continental United States, at a level of distribution con-

ceived as the retail level, to the whole population up to 1941 and to the population not in the armed forces overseas thereafter. I happen not to feel kindly toward calling this index an index of per capita consumption of all food, for the word consumption used with reference to food means to me something eaten that nourishes the body, whereas the statistics, if really measuring food at retail level, must refer to food purchasable or purchased—not necessarily or even probably the same thing.

The official statistics do not seem actually to measure "food available at retail level," although this is the summary description given inside the document, any better than they measure "food available at primary-distribution level." If item by item for more than 200 foods one looks at the description of the estimating processes, and then sets calorie values per capita against each, it can be reckoned that foods providing two-thirds to three-fourths of the aggregate calories are estimated at a level of distribution antecedent to retail. Examples are flour at mill door, sugar at refinery, vegetable fats and oils and lard at processing plants, milk at the distributors'. In the titles of tables, the words "retail level" are therefore put in quotes. I should say in passing, however, that it may be true that there is less of a gap between primary-distribution level and retail level for such commodities as wheat flour, sugar, milk, and the visible fats, which are estimated at primary-distribution level, than there is for such items as meat, and fresh vegetables and fruits, which are estimated at retail level. The trouble is that we really know next to nothing about disappearances to nonfood uses in the distributive mechanism between primary distribution and retail levels of the big calorie suppliers like grain products, sugar, milk, and visible fats.

One of the numbers in the first column of Table 1 says that on the average in the three years 1949-51, the average person had available, at a level more or less like retail, 3,220 calories of food. We next have to ask whether there is a margin of error in this estimate, and if so how large it is. Of course the question cannot be answered precisely if the level is not in fact retail. But even if we assume that it is near enough the retail level for practical purposes, we would expect some degree of understatement for simple reasons of incomplete coverage. It is certain that alcoholic beverages are deliberately excluded although they provide food calories. Also it is possible to specify omission of fruits produced in nonfarm home gardens or orchards, as well as some wild fruits and nuts. I suspect and calculate that omissions amount to less than 200 calories.

Understatement must persist throughout the official series from 1909. And, as one moves backward from 1950 to 1910, another source of inaccuracy may emerge, with reference to calories though not to poundages. For the only possible procedure is to assume that a pound of any specific

TABLE 1. FOODS OF ANIMAL AND OF VEGETABLE ORIGIN IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(Calories per capita per day; percent of all food calories)

Year or period	Calories			Percent		
	All foods	Animal foods	Vegetable foods	All foods	Animal foods	Vegetable foods
1879	3,729	1,269	2,460	100.0	34.0	66.0
1889	3,667	1,282	2,385	100.0	35.0	65.0
1899	3,701	1,288	2,413	100.0	34.8	65.2
1909–11	3,503	1,238	2,265	100.0	35.3	64.7
1919–21	3,303	1,183	2,120	100.0	35.8	64.2
1929–31	3,437	1,242	2,195	100.0	36.1	63.9
1939–41	3,363	1,282	2,081	100.0	38.1	61.9
1949–51	3,220	1,300	1,920	100.0	40.4	59.6

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States, 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).

food contained precisely the same number of calories whether in 1880, 1910, or 1950. This might not be so, if a pound of beef contains more fat than once it did, a pound of bacon less, and so on, as is conceivable but not demonstrable. As yet, nothing can be done with this problem.

Hence all the calorie figures in the tables are less precise than the heart desires. Even so, taking them in comparison with many time series used in economics, they may be rather good ones.

On one aspect of the problem of coverage, there seems little cause to be troubled. The convincing drift of evidence is that no item once inserted into the array of items available ever actually disappears from it, though there may be near-disappearance. This is true if the items are, so to speak, "parent foodstuffs" but not particular dishes. And it is quite clear that very few parent foodstuffs have been born, so to speak, during the years since 1879. Innovations come not in parent foodstuffs but in mixtures of them.

II

But the series are not good ones if they are regarded as measuring not per capita availability of food about at retail level, but actual per capita ingestion of food calories. Many people fall into precisely this error, even though it is really obvious that there are two principal categories of food available at retail level, that which is humanly ingested and that which is not ingested. How to make a reasonably precise division is not known. Nutritional scientists express themselves as believing that per capita ingestion in recent years has run somewhere from 2,400 to 2,800 calories and I suppose they mean to include all ingested calories. Hence noningestion of food calories available at retail, if we say that items not cov-

ered by the official estimates run to 150 calories per capita, might have run between 570 and 970 calories per capita per day. The latter figure seems like a shockingly large fraction of the total—three-tenths of it around 1950—to have been lost in transit and in storage by means of fire, flood, frost, wreck, contamination, or to have been spoiled, diverted to industrial uses, fed to pet animals, wasted in cooking and on plates and poured down drains and thrown in garbage cans, and in other ways. But it may not be an incredible fraction. The same sort of argument can be applied commodity by commodity.

On this matter of the relative importance of ingestion and noningestion we need more basic statistical evidence. We need it not only for its own sake, but also because people nowadays are forming the habit of making international comparisons of per capita food availabilities at something like retail levels, and from the figures drawing conclusions about human hunger and human health. It is intellectually dangerous to do this unless and until we have data on ingestion, which we do not have. Only food ingested can affect hunger or health. Unwarranted assertions are being made today, by nutritional scientists, about a causative relation between upward trend in per capita fat consumption in this country and rising incidence of coronary disease. The truth is that nobody knows whether or not fat ingestion has been rising. All we know is that per capita availability of fat at retail level has been increasing for some 70 years. But may not waste or noningestion of fat have increased so much that per capita fat ingestion has in fact fallen? This we do not know.

With respect to long-term trends, you will see from the first column of Table 1 that the official estimates plus my supplements before 1909 point toward a decline, little interrupted, in calories per capita available at retail from 1879 to 1950. The over-all decline is of a magnitude of nearly 14 per cent. It would be satisfying to know what part of the decline represents ingestion, what part noningestion. After prolonged calculations and thought, the most I can say is that I believe that the trend of ingestion is determinate as to direction, which is downward, but indeterminate as to amount; and that the trend of noningestion is not determinate either as to amount or as to direction. A couple of years ago I conjectured, though this was with reference to data from 1909 to 1950, that both trends were determinate as to direction and were downward, but were indeterminate as to amount.

Yet this lack of information, contemporary or historical, on the relative importance of per capita ingestion and per capita noningestion does not altogether jeopardize inquiry into changing patterns of food calories available at "retail level." What the lack does is to dampen one's tendencies to explain changes only in terms of eating habits. It looks as if we

ought to bear in mind also change in wasting or losing habits, even if not much more is feasible than to bear them in mind.

III

Although many problems emerge in attempting to estimate levels of per capita availability of foods prior to 1909, where the official publication begins, I doubt if anyone aside from the people who work on such things regularly have much interest in them. So I shall be brief, and in the main merely describe the kind of procedures that have to be followed.

First of all, one who works at this does not want to waste time and effort on trivial things. We have 218 commodities for which official data are given beginning with 1909. But, by finding out the calorie values per capita of each of these in 1909, we are able to narrow the area of inquiry a good deal. For practical purposes we can limit the number of time series requiring examination to 32, because only these 32 items each contributed as much as 10 calories per capita around 1910, and in their aggregate contributed all but 93 of the total calories per capita officially estimated—in short, the total calorie contribution of more than 150 food items has been so small as not to justify study item by item. They are mostly specific vegetables and fruits, foodstuffs low in calorie value per pound.

The important contributors of calories are made sufficiently clear, perhaps, in the tables. The best and most dependable estimates for years prior to 1909 are undoubtedly those (Tables 2 and 3) for wheat flour and cane and beet sugar, which have bases in census counts and import and export statistics and have been worked over by careful and competent scholars. Rather dependable too are the early estimates for corn sugar (Table 4), visible fats (Table 5), and, although the unchanged level does not suggest it, those for the minor grain products (Table 3), which are milled rice, rye flour, buckwheat flour, wheat cereal, corn cereal, cornstarch, hominy and grits, oatmeal, and barley meal and pearl barley. On these we can bring to bear milling and trade statistics. The most troublesome items among the vegetable products are corn meal, potatoes white and sweet (Table 3), and the succulent items (Table 5). With corn meal we also have milling and trade statistics to lean on, but the problem is to make an allowance for milled corn meal that was fed to animals and hence does not properly belong to an estimate of availability for human use at primary-distribution level, here conceived as identical with "retail level." There is an allowance of 9 per cent in the figures given—the same as was officially used for 1909. When one tries to estimate availability of potatoes in the early years, the only recourse open seems to be to take the production statistics for the appropriate periods and reduce them, as

TABLE 2. THREE CATEGORIES OF FOODS OF VEGETABLE ORIGIN, AND FOODS OF ANIMAL ORIGIN, IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(*Calories per capita per day; percent of all food calories*)

Year or period	Calories				Percent			
	Animal foods	Grains, potatoes	Sugars, sirups	Other vegetables	Animal foods	Grains, potatoes	Sugars, sirups	Other vegetables
1879	1,269	1,970	239	251	34.0	52.8	6.4	6.7
1889	1,282	1,796	307	282	35.0	49.0	8.4	7.7
1899	1,288	1,739	352	322	34.8	47.0	9.5	8.7
1909–11	1,238	1,499	408	358	35.5	42.8	11.6	10.2
1919–21	1,183	1,247	476	397	35.8	37.8	14.4	12.0
1929–31	1,242	1,167	555	473	36.1	34.0	16.1	13.8
1939–41	1,282	1,012	535	534	38.1	30.1	15.9	15.9
1949–51	1,300	855	519	547	40.4	26.5	16.2	17.0

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).

TABLE 3. GRAIN PRODUCTS AND POTATOES IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(*Calories per capita per day; percent of all food calories*)

Year or period	Calories				Percent			
	Wheat flour[a]	Corn meal	Minor grain products	Potatoes (white and sweet)	Wheat flour[a]	Corn meal	Minor grain products	Potatoes (white and sweet)
1879	1,019	652	131	168	27.3	17.5	3.5	4.5
1889	1,019	473	131	173	27.8	12.9	3.6	4.7
1899	1,019	420	131	169	27.5	11.3	3.5	4.6
1909–11	961	226	131	181	27.4	6.5	3.7	5.2
1919–21	802	155	131	159	24.2	4.7	4.0	4.8
1929–31	770	125	131	141	22.4	3.6	3.8	4.1
1939–41	698	94	98	122	20.8	2.8	2.9	3.6
1949–51	603	57	94	100	18.7	1.8	2.9	3.1

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).
[a] Includes semolina and whole-wheat flour.

is done officially for 1909, by 22 per cent so as to get an approximation to retail availability. As to the so-called "succulent" vegetable items, there is some direct evidence for the earlier years, but one has to supplement this with simple backward extrapolation of estimates covering the period 1909 to 1952.

The estimates of animal-product availability are the hardest to appraise. In the first place the nature of the problem of estimation even in the years since 1909 is such that the information available to the official

TABLE 4. SUGARS AND SIRUPS IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(Calories per capita per day; percent of all food calories)

Year or period	Calories			Percent		
	Sugar (cane and beet)	Sirups	Corn sugar	Sugar (cane and beet)	Sirups	Corn sugar
1879	191	46	2	5.1	1.2	[a]
1889	258	46	3	7.0	1.2	.1
1899	302	46	4	8.2	1.2	.1
1909–11	357	46	5	10.2	1.3	.1
1919–21	409	64	3	12.4	1.9	.1
1929–31	484	46	25	14.1	1.3	.7
1939–41	474	47	14	14.1	1.4	.4
1949–51	457	44	18	14.2	1.4	.6

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).
[a] Less than one-tenth of 1 percent.

TABLE 5. OTHER PRODUCTS OF VEGETABLE ORIGIN (EXCLUDING GRAIN PRODUCTS, POTATOES, SUGARS AND SIRUPS) IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(Calories per capita per day; percent of all food calories)

Year or period	Calories				Percent			
	Total	Visible fats[a]	High-calorie items[b]	Succulent items[c]	Total	Visible fats[a]	High-calorie items[b]	Succulent items[c]
1879	251	57	64	130	6.7	1.5	1.7	3.5
1889	282	75	66	141	7.7	2.0	1.8	3.8
1899	322	97	75	150	8.7	2.6	2.0	4.1
1909–11	358	116	94	148	10.2	3.3	2.7	4.2
1919–21	397	146	110	141	12.0	4.4	3.3	4.3
1929–31	473	186	120	167	13.8	5.4	3.5	4.9
1939–41	534	212	138	184	15.9	6.3	4.1	5.5
1949–51	547	251	123	173	17.0	7.8	3.8	5.4

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States, 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).
[a] Shortening and edible vegetable oils, and margarine.
[b] Dry beans and peas, peanuts, tree nuts, dried fruits, and chocolate.
[c] All other foods of vegetable origin.

estimators cannot be of high quality. These are flow items, not produced like field crops so to speak in one fell swoop in a year, and this makes even the total output difficult to count. Only recently has there been anything like comprehensive slaughter statistics. We can, it is true, find official estimates of eggs, lard, beef, lean pork, salt side, bacon, lamb and mutton, and veal back to 1899. But to reach estimates of availability prior to 1899 one can, I think, have resort only to livestock counts, and to the

supposition that the relationship of counts to retail availability was about the same in these earlier years as in later ones. Most conjectural of all is the per capita availability of milk and its products (Table 6) prior to 1909. Official estimates for early years exist for some of the products—butter, cheese, and evaporated and condensed milk. But skim milk, cream, whole milk, and a considerable list of minor milk products are not so estimated. We do have census estimates of output of all milk for 1899 and 1909. In the main, however, the estimates of per capita availability of milk and its products (Table 6) before 1899 have to rest more heavily than I like on the supposition that the important whole-milk component should have changed roughly as the officially estimated butter component changed. This may not be a satisfying supposition. But I would not want

TABLE 6. ANIMAL PRODUCTS IN TOTAL FOOD AVAILABLE AT "RETAIL LEVEL" IN THE UNITED STATES, 1879–1951*

(*Calories per capita per day; percent of all food calories*)

Year or period	Calories				Percent			
	Milk and its products	Beef and veal	Pigmeat and fat	Eggs, fish, other meat	Milk and its products	Beef and veal	Pigmeat and fat	Eggs, fish, other meat
1879	448	152	521	148	12.0	4.1	14.0	4.0
1889	480	157	492	153	13.1	4.3	13.4	4.2
1899	500	142	483	163	13.5	3.8	13.1	4.4
1909–11	479	151	443	165	13.7	4.3	12.6	4.7
1919–21	480	128	419	156	14.5	3.9	12.7	4.7
1929–31	515	107	460	160	15.0	3.1	13.4	4.7
1939–41	528	125	469	160	15.7	3.7	13.9	4.8
1949–51	520	133	458	189	16.1	4.1	14.2	5.9

* From or compiled from U. S. Dept. Agr., *Consumption of Food in the United States, 1909–52* (Agr. Hdbk. 62, Sept. 1953), and its *Supplement for 1954* (Oct. 1955).

to assume that the whole-milk component could have been falling in per capita availability if, as seems fairly well indicated, the butter, cheese, and evaporated-and-condensed-milk components were rising and only the components of skim milk and buttermilk were falling.

The general outcome of such procedures in estimating levels of per capita availability of food before 1909 did not, when I came to add up the individual estimates, throw up aggregates that appeared to me to be palpably absurd. They seemed to fit pretty well, in the sense of displaying trends, with the official data after 1909. I felt a degree of confidence in the estimates, to the extent at least of being unable to imagine how someone else going over the same ground could arrive at a fundamentally different broad picture. The most troublesome feature of the early estimates is the high level of per capita availability of corn meal. That the corn meal was produced is not doubtful; what is doubtful is the extent

to which the production requires to be reduced in order to achieve comparability with the post-1909 official estimates.

IV

Problems of interpretation now begin to present themselves. We have first the fact that with some degree of interruption the per capita calorie value of *all* food at approximately "retail level" has tended to decline. We have next the fact that, of all food calories per capita available at approximately "retail level," the proportion derived from foodstuffs of animal origin has risen, while the proportion derived from foodstuffs of vegetable origin has fallen. This is not widely known as a fact, and it conceivably runs counter to what can be read in some older books about the inevitability of the world's food supply and food ingestion becoming increasingly vegetarian in composition. We have next the fact that the proportion of total food calories derived from the grains and potatoes has persistently and heavily fallen for 70 years, while the proportion derived from all other foodstuffs, including those of animal origin, has persistently risen. We can next see, from Table 2, that the proportional contribution of calories derived from other vegetable foods than grains and potatoes and sugars and sirups to the total has risen persistently and largely, whereas the proportional contribution of sugar, while rising largely and persistently for 50 years, ceased to rise in the last two decades.

In Table 3, we see that the proportional contribution of corn meal has fallen persistently throughout the period, but the proportional contribution of wheat flour and of potatoes was maintained, potatoes perhaps even increased, in the first 30 years. From Tables 2 and 6 we see that, although the general trend was for all animal products together to rise in importance, it was milk and its product and a group covering eggs, fish, and "other meats" that made for the rise; the proportional contribution of beef and veal and pigmeat and fat together in fact fell for 50 years and rose only during the past two decades.

All of the statistical facts, and perhaps a good many more if we should choose to probe into details, regrouping statistical series or breaking some of them down into smaller and smaller commodity groups and individual commodities, pose problems of explanation in terms of causation. I shall attempt only to hit a few high spots.

An initial question to ask is whether the decline in per capita availability of all food at "retail level," some 14 per cent over 70 years, represents decline of food ingested by people or of food not ingested. The answer to this I have indicated: decline of ingestion appears certain, but even the direction of change in the level of noningestion appears indeterminate.

If decline in per capita ingestion is real, are we to believe that the

cause has been increasing pressure of involuntary hunger? This is utterly incredible in the light of the food net export status of the country and the enormous size of the feed bin consisting of humanly edible grain which could be eaten; and of course there is other evidence too, as in the absence of general and widespread hunger at any time.

The indications are rather that decline of per capita ingestion of all food has been voluntary and is to be explained proximately in terms jointly of reduced per capita requirement for food energy and of pure choice to hold body weight down. The per capita requirement of calories must have fallen in general as machine work has come to supplant physical labor practically everywhere, including getting to work from the home and women's work in the home, and as weekly hours of labor in industry, on farms, and in homes have declined. Change in the age distribution of the population, with first proportionally more older people and later proportionally more both of old and very young, would have tended in the same direction. So would the change in geographical distribution of population, the proportions living in warmer climates having increased. Exposure to the cold, which enhances the calorie requirement, has lessened for this reason and also because heating of interiors of all sorts is generally better. It is difficult to think of any counteracting influence on the per capita calorie-ingestion requirement other than some increase of adult body height—I dare not say height *and* weight, for one must suppose that the proportion of overweight people in the population is less than it used to be. Perhaps, however, this is a phenomenon only of the past two or three decades. The newspapers were not carrying suggestions for dieting that would reduce weight with or without conscious effort three decades ago.

And why have all these influences toward reduction of per capita calorie requirement been operative? Invention, resource discovery, capital formation, economic development, real-income enhancement, are words that come to mind. In seeking the causes of a decline in per capita calorie ingestion, and at least largely because of that a statistcally evident decline in per capita availability of food calories at retail level, it does not seem to me necessary to go behind the phenomenon of advancing per capita real income. And I do not see how a decline in per capita availability of all food calories in the absence of growing prevalence of hunger could possibly have occurred unless the trend of per capita real income had been upward.

The question may well be raised whether or not any society over any 70 years with a rising trend of per capita real income necessarily has a decline in per capita ingestion of all food calories, possibly of per capita food availability at retail. This I have not thought through, but I suspect

not. Conceivably a hunting-and-gathering society subject to periodic famine might increase its per capita real income and its per capita food ingestion too by a shift to sedentary agriculture free from famine, if one can imagine this happening in 70 years. Conceivably an agricultural society might pass through a stage of applying increased per capita physical labor to production of a trading surplus with effects of elevating both per capita food ingestion and per capita real income. On the other hand it seems conceivable that a highly industrialized and mechanized society might sometime reach a situation such that per capita ingestion fell nearly to and stabilized nearly at the physiologically minimum level of per capita basal metabolism, while per capita real income continued to rise. Validity for all times and human circumstances surely cannot be a characteristic of the relationship shown between trend of per capita ingestion and trend of per capita real income in the United States for 70 years before 1950. Perhaps we have to restrict the probable validity to time after the industrial revolution and to societies that have rather more than begun to participate in it, and also to time prior to achievement of something resembling an economic Utopia. There seems to be here a problem of establishing limits of validity.

What can now be described as the causes of a rather precipitous decline in the proportional contribution to total food calories of calories derived from grain products and potatoes, and the converse rise in the proportion derived from all other foodstuffs—the one falling from 53 to 27 per cent of the total, the other rising from 27 to 73 per cent? All sorts of explanations are offered: that housewives have become lazy and have gradually given over home cooking of palatable items made out of the grain products in favor of buying stuff in cans; that bakers refuse to make good bread and the people reject it in favor of almost anything else; that advertising has altered peoples' preferences, the grain-product-and-potato advertisers losing out to the advertisers of everything else; that nutritional scientists and home economists have scared people way from starchy foods and sugars in favor of foods richer in vitamins and minerals; simply that public preference has changed; that retail shops now carry a far wider range of foods than once they did, and with the shops more accessible, people do not have to fall back so much upon familiar staples like flour and corn meal; that people eat out more than they did in restaurants and the restaurants serve smaller and smaller helpings of bread and potatoes; and so on. Then there is the much more economically sophisticated argument that a good deal of this big shift must be due to changing price relationships of food at retail—sugar, for example, tending to become cheaper per 1,000 calories than flour made into bread, or than potatoes. And then there is the position, which with some qualification is mine,

that one cannot reach a satisfying explanation without reference to the generally rising trend of real income per capita.

In taking such a position, I have to resort to some postulates: first, that a fundamental psychological attitude of people toward food is to crave and seek variety of flavor and texture; second, that the human animal, like other animals, will, if allowed free choice, select from the wide range of foods a diet that is so balanced nutritionally as not to jeopardize reproduction of the species; and third, that social traditions concerning food have the effect of delaying innovation. The general postulate is then that human beings drive for diversity and nutritional balance of food ingestion yet will change the composition of their intake somewhat slowly under circumstances of free choice.

Free choice of food, however, cannot be said to exist unless among the millionaire fringe of any population. Income must be an influence that inhibits it. Therefore we must conclude that, if the various types of food are normally priced in the markets at different prices per thousand calories and calorie requirements per capita are restricted to a narrow range, the basic psychological drive for diversity will be defeated in the absence of either (a) increase of per capita real income, or (b) change in the spreads between prices of the various foods per thousand calories—or a combination of the two. It seems to me quite possible that increase of income without change of price relationships could result in change in the commodity composition of food ingested, and that change in price relationships without change in income could also result in change in the composition of the ingested food.

In looking back now to the statistics showing heavy decline in the proportion of total calories derived from grain products and potatoes, can one feel that a sufficient explanation appears? I am nearly satisfied, but not wholly so. It can be demonstrated that over the 70 years the grains and potatoes taken as a group have stood lower in price per thousand calories than all other foods taken together. What cannot be demonstrated, so far as I know, is that the price per thousand calories of the grain products and potatoes has risen in relation to the price per thousand calories of all other foods together. Such a change seems required if changing relationship of prices is to be accepted as the cause of the decline in per capita ingestion of grain products and potatoes and the converse rise in ingestion of the other foods. In fact, so far as I have gone into the statistics of changing price relations, it looks as if the price of grain products and potatoes has fallen, not risen, in relation to the prices of all other foods together. Hence, subject to confirmation of this in terms of empirical evidence, it seems that we will have to conclude that income change was, by and large, the dominant influence. Rising per capita real

income, which can be demonstrated, permitted the urge for diversification of food ingestion to take place, and the relatively dear group of commodities rose.

The generally rising trend, shown in Table 1, for the proportional contribution to all food of foods of animal origin to rise, while the proportional contribution of foods of vegetable origin fell, is perhaps amenable to the same explanation. But if we had price-per-thousand-calories indexes of these two series, I suspect that the one applicable to animal products would show a very substantial rise in relation to the index for all vegetable products—and a larger relative rise than would be shown by a price index of nongrain and potato products in relation to a price index of grain and potato products. This remains to be empirically verified. Subject again to the verification, it looks as if one has to take into account a greater change in the relation between the first two indexes than between the second two in order to understand why, with rising income, less emphasis fell on increasing proportional ingestion of animal products than upon increasing proportional ingestion of the summation of sugars and sirups and other vegetable foods than grains and potatoes, as in Table 2. This seems to be a palpable modification of the rising-income effect by the changing-price-relation effect. When these large groups are subdivided, I suspect that a good many of the indicated trends could be similarly explained. The large gap in information here lies with price statistics and their manipulation.

Reversible trends seem to deserve a little speculation. One of those I have pointed out already. In Table 6, if one adds the sixth and seventh columns, it will appear that the proportional contribution of beef and veal plus pigmeat and fat declined for 50 years and then reversed its trend. This would clearly require an examination of changing price relationships that I have not made. But perhaps it suggests something more —namely, that for adequate explanation inquiry is necessary into the timing and *degree* of change respectively in per capita real income and price relationships. It seems imaginable, subject to verification, that for 50 years the cattle-and-hog-price index was rising so rapidly in relation to other prices that cattle and hog meat lost position in the hierarchy of foods ingested despite persistently rising income; whereas for the recent 20 years, even if relative price enhancement continued, the rise of income was so great as to negate it. But this cannot be accepted without detailed inquiry into the timing and extent of relative price change and income change. Whether the effort is justifiable in view of the questionable accuracy of the data is a moot point.

Another instance of reversed trend appears in the statistics for potatoes (Table 3), which may have been rising in importance as a component of

food availability up to 1910 but to have declined thereafter. One of my colleagues, Roger Gray, has suggested that here is a reflection of an influence different from income or price—namely that the proportion of the population who were immigrants from potato-using countries of northwestern Europe was rising prior to 1910 but not later, and that the social force of traditional potato eating was strong in them. Perhaps the procedure would be rewarding of classifying the population into groups of given food traditions and following changes in the proportional numbers of the groups.

The statistics of sugar in Table 4 also deserve notice because they too force the question whether other influences than relative price change and income change must not be found if the trend is to be explained. Here we know that the general drift of sugar prices in relation to other food prices has been downward, while the drift of income has been upward. Then why should there have been an expectable response toward increase of per capita availability of sugar for 50 years and after that none? Perhaps there emerges here a question about the existence of some kind of a law of commodity saturation or of maximum proportionality. With respect to sugar and pure or nearly pure animal fat, such as lard, tallow, salt side, and bacon, an upper limit of proportional contribution to total calories ingested inevitably exists for each because these items provide nothing or nearly nothing but fuel for the human body; and other items containing protein and minerals and vitamins are necessary to sustain life. Thus for sugar there is surely an upper limit of ingestion physiologically imposed. Next, however, one has to ask if there is some other kind of a limit, one may say mechanically imposed if total calorie ingestion per capita is only slightly variable over time, and if people persistently seek variety and once knowing a parent foodstuff will not abandon it. If these principles are valid, a mechanical upper limit must exist on the per capita ingestion of any parent foodstuff. It would certainly be a problem to ascertain what any of those upper limits might be. Conversely, there must be lower limits of per capita ingestion too.

The trend of per capita availability of sugar suggests another qualification of fundamental influences governing trends. The basic tendency to diversify the composition of food intake can probably be modified through education or propaganda or advertising. Possibly one of the valid reasons why sugar has ceased to gain position in the aggregate of all food available is that word has got around that sugar, having nothing more healthful in it than food energy, could wisely be squeezed down as a proportion of the calorie intake and supplanted with so-called protective foods rich in proteins, vitamins, and minerals. It is not necessary to the exertion of influence that the word should be true; on the other hand it

may not be true that the mere word has exerted any influence at all, for perhaps quite other influences sufficiently explain the check to the earlier upward drift in importance of sugar in total availability. What strikes the mind is, that the check to sugar ingestion seems to have occurred around 1925, perhaps as much as 15 years before the educational process tending to disfavor it gathered appreciable steam.

V

In conclusion, let me pose the problem of projection of trends, for this is a matter of considerable interest to our Department of Agriculture, to nutritional scientists, and to commodity dealers and food industries. Let us say that 1975 is as long a time away as we now want to project. Let us say that we would be doing well enough to project trends in only five series—the first column of Table 1, and the first four of Table 2, from which, of course, we could calculate all the other columns in the two tables.

Purely mechanical extrapolations—the fitting and projection of trend lines—would look to be silly, if only because there must be a lower limit on total per capita calorie ingestion, because we know nothing about the trend of per capita noningestion of calories, because there must be lower limits on ingestion of commodity groups tending downward, because there must be upper limits on ingestion of commodity groups that have gained historically in importance.

It would seem futile also to try to proceed under all conceivable assumptions about trend of per capita income and changes in relative price. Even so, I suppose that the sort of assumptions one would choose would involve continuing upward trend in per capita real income and—though this is pure guess work—not a great deal of change in price relationships from those existing say since 1948 or even later. Perhaps one could pass lightly over any assumptions about educational influences and changing composition of population, so long as he made the assumptions about income and price.

All told, however, it seems to me doubtful if the predictive value of what we know statistically and may believe to be the influences responsible for historical change is good enough to assure us of an outcome that would not call for verification from some other quarter. A different approach does seem to me possibly feasible and certainly important. If one could conduct a reliable sample survey of the food use now customary among the highest-income tenth of the population, such a survey would promise to provide a really useful clue to kinds and degrees of change in the commodity composition of food supplies available at retail level reasonably likely to occur in the future under the assumption of continuing

rise in national real income per capita. Much might be learned, too, from records of food purchased and food discarded of luxury passenger liners, where the passengers have substantially free choice of food after once they have the fare. Records of luxury American-plan hotels might also help. Any such inquiries as these would pose interesting problems of design, method, and participation. They merit consideration, especially the sample survey of food use among the highest-income group, for its predictive value would be considerable.

DISCUSSION: MAJOR CURRENT PROBLEMS IN NUTRITION RESEARCH

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Nutritionists today are or should be concerned with the relation of their knowledge regarding food and their research in this field to the problems of agricultural economists who are also concerned with food. Likewise agricultural economists are or should be concerned with the relation of their problems and their research to those of the nutritionists. Too often each goes his own way oblivious to the problems of the other. We are, therefore, particularly fortunate today to have a nutritionist discuss with agricultural economists recent developments and problems in his field.

Dr. Griffith has ably pointed out the progress made recently in nutrition research and some points on which further work needs to be done. He has also pointed out some of the economic implications of the findings. I wish to emphasize two points of direct concern to both nutritionists and agricultural economists. These are (1) the relation of nutritional needs of our population and what is produced, and (2) the relation of marketing procedures and food technology to the nutritive values of foods.

A direct relationship exists between what and how much the population of a country eats and its well being. When we have foods in the kinds and quantities necessary to keep us in optimum health we have a real sense of well-being. We are satisfied as consumers. We are vigorous and efficient as producers. Our efficiency as individuals and as a nation would be greatly increased if we produced and ate the kinds of foods in the quantities the scientists recommend according to current knowledge of what makes for good nutrition. Yet, as a nation and as individuals we are rather far from producing and consuming the foods "best" nutritionally for us.

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Several factors are responsible for this situation. First, as Dr. Griffith pointed out, we do not as yet always know what foods produce optimum health and efficiency. We have made great strides in this direction but there is still much we need to know. Second, we must take into account producers who grow, process, and market the foods that give them the greatest profits. Third, we must take into account consumers who eat the food.

I am often distressed, as I am sure you are, by producers who look toward increased consumption of their particular products as a way out of their particular dilemma particularly the dilemma sometimes called "over production." They know but ignore the fact that an individual's capacity to consume food is physiologically limited. Wheat producers want us to eat one more slice of bread a day, dairy people to drink one more glass of milk, egg producers to consume one more egg, the citrus people one more orange, the apple growers one more apple, and on and on. Each industry optimistically hopes by new developments in processing and by vigorous advertising campaigns to secure an increased proportion of the limited capacity of our stomachs.

I regret to say that too often their effects are diametrically opposed to what we know about good nutrition. The information they present in advertising and elsewhere may be misleading, sometimes even false. They pit consumption of one product against another. It is no wonder that consumers are today often misled and all too frequently confused about the foods they "should" eat.

Consumers today do not have the nutrition "know how" referred to by Griffith. This fact, however, should not be laid "in total" at the feet of producers. Many consumers make no real effort to secure important, reliable facts about nutrition. They rely on myths and information that has long proved erroneous. Many of them, even if they have the "know how," ignore it. They eat what they like and want to eat regardless of the effect on their health and their girths. Then there are always some, even in these prosperous times, whose incomes are so small that they have difficulty stretching their budgets to include the foods necessary to maintain optimum health.

As Griffith mentioned a very real interest in food exists in this country today. Most of us enjoy eating. We have made eating a part of most social contacts. Today a majority of people can afford to eat the things they like best. New food products in new forms are constantly being made available to us. As a result we hear much today about the large numbers in our population who are overweight.

Many people are undoubtedly concerned with the problem of overweight either from a health standpoint or from the standpoint of appear-

ance. However, some do not feel strongly enough to do anything about it. Others go to extremes in following dietary fads. I am often appalled by the extent to which people subject themselves to these faddist diets, which are neither appetizing or safe. They too often leave out essential foods and consume those least essential to the detriment of their health.

I agree most heartily that optimum weight can be achieved by dietary self control. Will power and nutritional "know how" of what constitutes an adequate diet in the light of current scientific information constitute the only two ingredients necessary for a safe and sane reducing diet. The second point is the need to be concerned with the effects of processing and marketing on the nutritional values of foods. The conditions under which products are transported and the time that elapses between processor and retailer or consumer is known to effect the nutritive value of foods. We eat many fruits and vegetables for their vitamin content, yet much of this value may be lost because of the manner in which these foods are handled in wholesale and retail markets. The production and conservation of nutritive values by growers and processors is of little service if these values are lost in marketing. For example, many processors of frozen foods go to considerable lengths to insure a minimum amount of time between the field and the freezer. Yet when these products pass through the marketing channels much of the food value conserved by such efforts are lost. Failure on the part of marketing agencies to recognize the importance of such simple procedures as providing proper directions for use and care of foods often results in loss of nutritive values. For example, often the directions for cooking frozen foods are such that when followed by the housewife their nutritive values are lost rather than conserved.

Consumers are not altogether blameless in this matter of effect of handling and care on nutritive values of goods. They expose their meat, milk, frozen foods and the like to unsafe temperatures in getting them from the market to their refrigerators or their tables. They do not take precautions in the care and preparation of foods in the home to conserve the nutritive values that survive processing and marketing procedures.

All of us have responsibilities for improving this situation. These responsibilities rest upon the effectiveness of the research and educational programs in which most of us here today are engaged. The scientists have responsibilities for carrying on the research that provides us with the most reliable information regarding the relation of the foods we eat to optimum health and well being. We need research not only on such problems as Dr. Griffith outlines but also upon the effects of marketing on nutritive values. Agricultural economists, especially marketing specialists, must help producers recognize their responsibilities for providing foods

that meet our needs nutritionally and for conserving the nutritive values of these foods as they are made available to consumers. Public health nutritionists, home economists, and educators in all fields have responsibilities for conducting more effective educational programs to see that consumers have the nutritional "know out" to choose the right foods, to care for, and prepare them properly.

DISCUSSION: STUDIES OF THE CONSUMPTION OF FOOD AND THEIR USES

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My remarks are not particularly critical of Miss Burk's paper as such. Some of them are critical of conditions found within the field of data, while others are supplementary. The latter deal with the notion of a trend towards homogeneity of food consumption and clues that may be helpful to forecast consumption trends within the food field.

Two Remarks About Food Consumption Data

Faultiness of privately supplied data. Most data secured from the U. S. Department of Agriculture, the U. S. Department of Commerce, or from any other governmental agency are available either without cost, or the costs are very small. They are available to everybody. The data are freely criticized, and the impression is sometimes gained that they are being criticized because they are freely supplied by a governmental agency and are not exclusive. This probably sounds nonsensical.

A different attitude prevails towards privately supplied data. They shouldn't be discussed, least of all publicly, nor criticized. Securing such data has become big business, for which some firms in the consumer goods field, mostly food, pay large sums going up to one-half million dollars per year and more. There are particularly two such services that deserve the attention of the marketing logician, one based on a store panel, the other one on a homemakers' panel. The first one reports store movement, the other purchases by housewives. Since both survey areas are closely allied, or practically identical, the assumption may be in order that for identical commodities the reports from both services should be identical, or nearly so. However, this is not the case. Great disparities are observed. Sales are apart not only 5 or 10 per cent, which would not matter, but by larger percentage points. In the writer's collection there

* The ideas expressed herein are the writer's exclusively. They do not reflect in any way the thinking of the management of the firm with which he is associated.

are cases where estimated sales or purchases, respectively, are as much as from 30 to 40 per cent apart. This latter observation is taken from the reports on a heavy-volume item where a higher degree of accuracy may be expected than is indicated.[1]

In instances of a thin market and of short time periods, the value of data secured by such panels appears to be even more doubtful because the problem of "blowing up the sample" becomes more risky. The writer knows cases where consumer sales were overestimated up to 80 per cent, and of others where weekly sales and share of market are reported in an erratic manner. This last instance is taken from reports on a commodity that enjoys a steady flow out of stores and a high per cent of national distribution in chains and super markets.

Per capita consumption data have lost some of their original statistical meaning; respective series are no longer homogeneous because of technological changes. Can per capita consumption data of lettuce, based on production figures from the 'twenties and 'thirties be compared with today's data, when spoilage is much smaller than it was thirty years ago? Did a car of Florida oranges sold before the War in fresh form yield the same number of gallons of juice as does a car of the same weight and quality, but going through the processing plant, today? The homemaker simply cannot make as many portions as the processor does. Modern technology has created a different yield ratio and, in some instances, a surplus.[2]

One more example. It would probably be correct to compute per capita consumption of coffee by dividing imports by the number of people. By doing this a series would be obtained which, until 1946 or thereabouts, was fairly homogeneous. This is no longer so. Close to 40% of the coffee drinkers use instant coffee now, the use of which is much more economical than the brewing of coffee. There is no waste in instant coffee. If the daily breakfast requirement is for 3½ cups, one can make exactly that quantity by using instant coffee. On the other hand, brewing of coffee is associated with a waste of up to 30 per cent. It is for this reason that coffee-producing countries do not like instant coffee. The

[1] The writer regrets that for various reasons, one of them legal, the two surveys cannot be discussed more thoroughly. They cannot even be mentioned by name.

[2] Cranberry growers have told the writer on many occasions that processing of nearly 60% of the cranberry crop has been responsible for the heavy carryovers of cranberries in freezers. Growers think (1) that processors of cranberries are much more efficient than the average homemaker in the preparation of cranberries for the table, therefore more eating portions are produced, and (2) that homemakers buy now 1 lb. of canned sauce in lieu of 1 lb. of fresh cranberries, as they did formerly. If this is correct, homemakers buy only one-third of what they used to at any one time. (Cannery yield of 100 lbs. of cranberries is approximately 280 lbs. of canned sauce.)

latter cuts down the percentage of unused coffee that goes down the drain. A per capita consumption series, computed as indicated above, covering the last thirty to forty years is, therefore, no longer homogeneous.

Trend Toward Homogeneity in Food Consumption

The question may be asked—is there a trend toward homogeneity in food consumption and how can it be described? Secondly, is this trend continuing? If there is such a trend, will we reach a point where the "ham tastes like the cheese, and the cheese tastes like the ham?"

How do we know that there is such a trend?

1. Certain observations are made, such that all machine made bread tastes alike—namely like "straw"—but that the public buys it nevertheless; that nearly all domestic beers taste alike, or nearly so. Or, if the varieties of cocktails served in prewar days in the homes are compared with just scotch or rye and water today, a high degree of simplification is observed. This lack of appreciation of flavor differences appears to be a function of a lack of education, of indifference, and of the additional work or costs involved. Such lack appears to be found more among young people than among older ones. All of this is a part of the "massification" of our society.
2. The application of the least-cost principle puts pressure on costly differentiations, thus flavor and type differentials tend to disappear.
3. Consumer tests of competitive products have the tendency to make brands identical relative to all characteristics commonly referred to as quality and flavor, because a manufacturer tends to adjust his product in accordance with results of the test, i.e. the negative characteristics, or the shortcomings of his product.
4. Physicians recommend to eat simpler food, to cut out this and that, which makes in some instances for a very monotonous or homogeneous diet.

Is this trend toward a higher degree of homogeneity continuing?

The writer is inclined to state that it is, but he would be very happy if told that he is wrong. More signs point that way than not. The forces mentioned as being partly responsible for it will continue to be with us in the future. More and more do the elegantly fixed meal and table disappear in the modern home, and with it table manners and conversation. The latter was already out before the "universal chatterbox" executed its death blow. What is left is a functional eating performance before the TV screen, in which case the pleasure associated with eating

a good and interesting meal has been displaced by the pleasure associated with viewing the video play.[3]

This trend toward greater homogeneity has been fought. Several illustrations may be given. In the big cities one finds bread, here and there, which is outstanding of flavor and other characteristics. Frozen food processors have enriched the number of frozen fish items available. In other words, technology has created a variety in some lines from which to choose as never before. However, it is difficult to say at this time whether these new foods will be universally accepted, or whether they will remain specialties like caviar and pate de fois gras. At any rate, they seem, at least in our time, to help us avoid the monotony of the Einheits beer, the Einheits supper, etc.[4]

Forecasting of Consumption Trends

Forecasting of consumption of food may be relatively easy in some instances, but more difficult in others. The trend of the large number groups, say, all vegetables, is easier to project than a fraction thereof.

Technical devices may be employed in some situations, while mere clues may be used in others: (1) The old-fashioned trend concept, often ridiculed as a forecasting device, may be used where sales are substantial or massive. (2) Price analyses can be employed in instances of a time-related trend which may be uncovered. Also, a price analysis may indicate that a particular commodity is no longer influenced by changes in per capita income. This appears to be an entirely new situation, which has not been fully explained or analyzed as yet. (3) Food patterns of consumers in higher income groups may be used as a guide if such patterns have been established by means of surveys or are known from other observations. Interesting in this case are the food habits of immigrants in this country. These food habits were usually not their own in the country of origin, but those of the wealthy members of their home communities. (4) Food habits of teenagers may prove a fertile field for investigation as a clue or indicator of future trends. (5) The physician's

[3] The writer is probably exaggerating. However, the beginnings of a trend cannot be denied. It may be more pronounced in big cities than in smaller ones.

The writer talked with club and restaurant managers, both of whom stated that the days of the master cook—the "Chef"—are disappearing, and with him that kind of dining which satisfied the differentiated palate. Menus are getting simpler because of fewer items. The writer saw the simplest one in a huge Beverly Hills restaurant, which announced but one item—Roast Beef.

[4] There are two observations that would lead to inferences contrary to what has been said. One of them is the number of food items, which averages about 4,000 in large super markets. The other observation is the food columns and recipes in newspapers and magazines. Both observations indicate a greater variety of food available today than, say, twenty or thirty years ago, and a greater interest on the part of homemakers in a high degree of differentiation and newness.

advice tends to change the food habits of millions of consumers; it has done so in the past, and will continue to do so in the future. The low caloric and low fat diets are principally of medical origin. These trends will continue and probably in a more accelerated manner. (6) Economies or diseconomies in the preparation of food, sometimes referred to as convenience coefficient, may act as a force which makes for popularity of foods, on the one hand, and for unpopularity on the other; thus could be responsible for a trend in consumption, either upward or downward. (7) Mechanization of production of a food commodity must be possible. It is reasonable to assume that wherever production cannot be mechanized the commodity will disappear. This is particularly true at time of full employment and within the fruit and vegetable field. Again, as under (6), we may have an upward or downward trend set in motion, depending on the degree of mechanization possible.

DISCUSSION: SOME PROBLEMS RAISED BY THE OFFICIAL STATISTICS OF AMERICAN PER CAPITA FOOD CONSUMPTION

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Many problems are inevitably raised when working with a subject of such scope and complexity as food consumption in the United States. The first problem encountered is the development of adequate data to determine what changes and trends actually have occurred. Then comes the problem of explanation where theoretical concepts and analysis need to be utilized suggesting analyses of concurrent changes in other variables. Finally, and probably most difficult, is the problem of projection. Dr. Bennett has treated these problems comprehensively and he has given tentative conclusions to some of them. Perhaps as many problems are raised as answered, but this is characteristic of research. I shall briefly list what I consider to be some of the main ideas or conclusions of his paper and then discuss them.

1. The official statistics on food consumption do not, in fact, measure food available at retail. We know little of losses in storage and transit or that part diverted to industrial uses. Because of further food losses or diverted uses after leaving the retail level, a great discrepancy is found between actual ingestion and the official estimates of calories available. This may be as high as 3/10 of the total estimate.

2. As a result of not knowing actual ingestion or of being really sure of food available at retail, the only thing that seems certain is some de-

crease in ingestion. The trend of noningestion is indeterminate as to amount and direction.

3. Total calorie ingestion has declined mainly because of reduced per capita requirements for food energy. Decreased need for food energy can come about only with a rising real per capita income. However, a trend of rising per capita real income will not always result in a decline in per capita ingestion of all food calories; it depends upon the country's stage of economic development.

4. The composition of food ingestion has changed mainly as a result of rising real per capita income. This follows from Bennett's hypothesis "that human beings drive for diversity and nutritional balance of food ingestion, yet will change the composition of their intake somewhat slowly under circumstances of free choice." Income is the limiting factor to free choice and only by rising income or changing price relationships among foods per thousand calories will diversity be attained. A combination of both the price and income effect is needed to explain some of the trends.

5. When examining the trends in foods such as sugar and potatoes, however, changing price relationships and rising real income alone may not provide an adequate explanation. Other factors, such as changing composition of the population and commodity saturation, may answer the question of causation.

6. A simple mechanistic projection of past trends could be very misleading in predicting future trends because of a lack of knowledge about noningestion and because upper and lower ingestion limits exist for foods in total and for particular commodities. A survey of the composition of the food consumption in the upper income class may provide the best guide to the future.

I think there should be general agreement that the official statistics do not measure food consumption in the sense of actual ingestion. There seem to be two sources of error. First, a large proportion of total food calories are measured at the primary distribution level. This overstates what finally reaches the consumer. Second, we know very little about food waste or diverted uses after it reaches the family, restaurant, or institution kitchen. The official statistics are aimed at an estimation of food available at retail or what ultimate consumers purchase and produce for their own use. This is the "disappearance" method in which food for consumption is derived from statistics on production, imports, exports, and change in stocks. Another method also used to determine purchased and home-produced food is by survey and appropriate weighting of representative families in the population. Three nationwide studies of this nature have been conducted in the years 1936, 1942, and 1948. After al-

lowance for differences in method and coverage, fairly close agreement on total calories available per capita is shown by the two methods. In 1948, the survey shows 3,250 calories available per capita compared with 3,210 in the official statistics. Larger differences appeared in the earlier studies, due mostly to explainable differences in the estimates of sugar. If the official statistics are a close measure of food available at retail in recent years, the great discrepancy between actual ingestion and availability must come from waste and loss after it reaches the initial point of consumption. The ingestion figure of 2,400 to 2,800 calories per capita is an estimate of average per capita calorie *requirement*—not *actual ingestion*. At the National Food and Nutrition Institute in 1952, Dr. W. H. Sebrell, who is Director of the National Institute of Health, stated that obesity is the number one health problem of the United States today. An estimated one-fourth of the adults in this country are obese. This may mean the ingestion figure is somewhat understated. However, if we accept the premise that people consume about what they require, calorie-wise, the discrepancy remains. I would feel that a study of food waste or loss between purchase and actual human consumption in homes, restaurants, and institutions might be most fruitful as a next step in this area. Waste tends to be characteristic of an opulent society; an important question is: How wasteful have we become?

Calorie consumption seems to be restricted within a fairly narrow range determined by physiological factors. The more sedentary a life one lives, the less calories are needed. If the calorie value of food intake is not reduced, obesity results. Most of the forces operating in the economy over the past 70 years have tended to reduce this requirement. One factor, which Bennett does not explicitly mention, may be quite important. Rural-urban composition of the population over the past 70 years has decreased from about 50 per cent rural to 16.5 per cent. In the *Consumer Purchases Study* of 1936 and in the *Survey of Family Spending and Saving in Wartime* in 1942, it was found that in both years rural farm people had available for consumption an average 500 more calories per capita than all nonfarm people. By assuming that rural people consumed 500 more calories than urban people in 1949-51, city people had available 3,127 calories per capita and rural people 3,637. Then, by assuming 1879 proportions of rural-urban population (approximately 50 per cent), urban people would have consumed 2,970 calories per capita. This means that 167 of the 509 calorie decrease could be attributed to changing rural-urban composition of the population. If one would further assume that calories available to rural people have not changed over this period, and by using an average computed value of rural calorie availability derived from the years 1936 and 1942, 385 of the 509 calorie de-

crease can be accounted for. There is some evidence to indicate that rural calorie availability may have been rather constant. The per capita volume index of home consumption has declined from about 112 in 1910 to 100 in 1954. However, I would expect the proportion of purchased calories by farm families to have increased by at least this amount because of the trend toward specialized and commercialized agriculture over this period. At any rate, growing urbanization would seem an important part of the answer to calorie decline. However, an agricultural population decline of the magnitude that has taken place in the United States could not have occurred without constantly increasing productivity and resulting rise in real income per capita.

The calorie value of food brought into homes seems to be negatively correlated with family income for the total United States population in 1942. In the 1942 study of family consumption, the calorie value of all food per capita in the United States was 3,000. For the income class of 0-$499, it was 3,100; for classes 500-$1,499, calorie availability was 3,000, and for income classes over $1,500 calorie availability was 2,900. For urban families the picture is somewhat different. Per capita calorie consumption increases from 2,500, at the 0-$499 income level, to 2,900 at the $2,500 income level and then remains constant. On the basis of research observations in this one year, indications are that as real income continues to rise, calorie availability will not increase but may continue to decrease. It is realized that survey data can show only static relationships; consumption patterns within income groups can and do change over time. Lower limits certainly exist for calorie ingestion. However, if non-ingestion or waste should be increasing, per capita availability of calories could remain constant or even increase, depending upon relative changes in the variables.

The composition of our diets has also shown marked changes over the past 70 years. Grains and potatoes have shown the greatest decline. The highest income groups consumed less of these products in 1942 and 1948. Also this highest third of the income groups showed the greatest percentage decline in the use of these two food groups between these years. The incomes of the lowest third of the income groups rose 165 per cent as compared to 119 per cent for the highest third. The lowest third increased their consumption of leafy, green, and yellow vegetables, citrus fruits and tomatoes; meat, poultry and fish; eggs; and sugar and sweets between 1942 and 1948 by considerably larger percentages than the other two income groups. Meat, poultry, and fish consumption in 1948 for the lowest group was 135 per cent of the consumption in 1942, compared with 99 per cent for the high income group. Income elasticities of demand with respect to quantity in 1948 show that foods with the highest

elasticities have also shown the greatest increases in the official statistics. Negative income elasticities are found for potatoes, sugar and sweets and for cereals. Higher negative elasticities for these food groups are found in income groups over $3,500.

The changing rural-urban composition of the population over the past 70 years may be an important factor in explaining trends in the availability of certain foods. For example, survey data show that farm people consumed about 40 per cent more grain products and 35 per cent more potatoes in 1936. At the same time all nonfarm people consume about 25 per cent more meat products. To the extent that we can assume such relationships held historically for grains and potatoes, this should be important in explaining trends in these food groups.

I realize that many potential sources of error exist in survey data, yet I feel that a brief discussion of some of the national survey findings tend to support Dr. Bennett's findings in working with the official estimates of food consumption. Consumption differences among groups, when the total population is classified in various ways, give us clues to explanation of over-all changes and trends.

Changing historical price relationships should also be examined. If the relative prices of grains and potatoes compared with other foods have increased, then we could say that the decline is due to substitution of relatively cheaper foods. The converse of this statement may not hold. If the relative prices of grains and potatoes have decreased and quantity consumed has declined, this may reflect a decreased demand for these products. It would be necessary to determine whether lower or higher prices were supply or demand induced to reach any conclusions. Changes in competitive structure and services added might also be relevant questions. Income elasticities of demand also may change. The point to be made is that interpretation of changes and trends in consumption cannot be made using any single set of criteria. A complex of forces is continuously in operation.

Commodity saturation is an important consideration. For the highest income groups, this point seems to have been reached for bakery products, fats and oils, potatoes, sweet potatoes, sugar, sweets, and the cereal products having negative income elasticities. Elasticity of demand, with respect to price for these commodities, is also low.

Consumption patterns in the highest income groups may be the best guide to future over-all changes. Simple projection of past trends and causes of these trends will not necessarily be operative in the future. However, examination of consumption patterns in the high income group as a key to the future assumes lower income groups will adopt consumption patterns of the present high income group. Consumption patterns of

the highest income groups also change over time.

As a final point, I would raise a question regarding the economists' concern with food ingestion and noningestion. Economic relevance and the economists' domain seem to be involved. If caloric adequacy is the only concern, food ingestion does not appear to be a significant problem. However, changes in ingestion and noningestion may be important as a part of the explanation of past trends in "consumption" figures and also in predicting future food demand.

THE ECONOMIC IMPACT OF TECHNOLOGY ON FARM COMMODITIES

Chairman: R. D. Rehnberg, Colorado A. and M. College

THE ECONOMIC IMPACT OF TECHNOLOGY ON MEAT PACKING*

K. E. MILLER**
Armour and Company

THE growth of American business since War II has not only increased competition for consumers' dollars and made satisfactory employees harder to get and to keep, but has also increased competition for livestock. Changes in the locale of livestock raising and in marketing methods have required that major packers reconsider what effective capacity should be at respective locations and how each plant should be operated.

These trends in livestock marketing, and major decreases in curing time and in space requirements, had left us with excess plant capacity at Chicago partly because we had both Armour and Morris units from the 1923 merger. Furthermore, we had been carrying on operations in a number of old and worn-out buildings spread over a wide area.

Our Chicago project, therefore, consisted of relocating the necessary facilities in existing substantial concrete and steel buildings at an expenditure of $12 million, including new equipment. Had we retained the previous layout, we faced nearly $6 million of reconditioning expense to continue to meet government inspection requirements.

Livestock has continued to become more important as a source of overall farm income. After the close of World War I, only about 47 per cent of farmers' cash receipts came from those sources; whereas during the last five years, they represented 55 per cent of receipts. Last year the percentage was 54 percent. This increased importance of meat animals as an income contributor has been accomplished despite a decrease in the demand for meat. Although the retail value of expenditures for meat increased postwar, this gain was much slower than the increase in income, with pork accounting for most of the relative decline. Meat prices have been much more volatile in recent years than the level of all commdities or even of food prices as a group.

Improvements in meat-packing technology include wide use of stainless steel. Streamlined hog-slaughtering facilities are now on one floor; the

* Presentation consisted of some 60 colored slides primarily illustrating operations in the rehabilitated Chicago plant. Comments that accompanied the pictures are summarized here.

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same operations formerly spread through five floors of an old building. Conveyors are in general use; even the viscera are placed in stainless-steel pans synchronized to move along with the carcasses for government inspection purposes.

Meat-packing structures are necessarily expensive to be long lasting and to remain sanitary. Floors must be of expensive brick laid with waterproof cement. Walls, floors, and ceilings of most work rooms are heavily insulated because refrigerated rooms necessarily adjoin warm rooms.

The new hog coolers chill the carcasses prior to cutting. A mechanized "pusher" moves the carcasses along overhead monorails. From the chill room the pork carcasses travel to a stainless-steel conveyor, where the major individual cuts, such as hams, bacon sides, loins, and shoulders are separated. A big circular motor-driven knife slices the shoulder from the side. Bandsaws are used for separating shoulders into picnics and Boston butts. An overhead rail carries spareribs. Bacon sides are trimmed as a stainless-steel belt moves by, and on another conveyor, the bones are removed from pork shoulders.

Hams slide down a stainless-steel chute from the pork-cutting floor, are graded into numerous weight and quality classifications, and sorted into bins. Then a fork-lift tractor transports a full bin of hams and raises them to a line of hoppers for the beginning of the curing process. Curing solution is injected directly into each ham. Through improvements in curing, processing, and in mechanized handling of meats, we have eliminated five or six hand handlings of each piece. All Chicago curing facilities are now consolidated into three connecting buildings where formerly they were spread out in seven.

The next step in the process takes place in a battery of 15 stainless-steel smokehouses, used exclusively for hams, bacon, and other smoked meats which provide a weekly smoking capacity of 1½ million pounds. These smokehouses are fully automatic in their control of temperature and humidity.

Bacon sides, after grading for size and quality, move to cure. A machine with tiny hollow needles injects curing solution evenly throughout the bacon sides. This shortens processing time from about 25 days to four, reduces curing space and amount of inventory carried. Cured bellies move to the new bacon room where up to nearly four tons per hour of product is sliced, weighed, and packaged.

Sausage is produced in a new $1,000,000 kitchen, one of the largest and most modern in the country. A chopper blends meats with pickles, olives, pimientos and other ingredients used in the scores of varieties of products. A stainless-steel frankfurter-linking machine performs a tedious and time-consuming job formerly done by hand. This machine makes 140 links a minute. Each new stainless-steel smokehouse, exclusively for saus-

age products, has a capacity of 1,800 pounds of franks. These smoking chambers provide automatic forced-draft temperature and humidity control for faster uniform smoking, at a cost of some $10,000 each. After smoking, an automatic frankfurter peeler takes over a job previously done by hand, and at a speed of 50 links a minute. Then individual pound packages of franks are mechanically wrapped and sealed in cellophane.

Much attention and expenditure has been in facilities for producing consumer-size branded products. In the new luncheon-meat room, one of the most recent developments is the preslicing and vacuum packaging of luncheon meats.

A skinless-pork-sausage machine automatically shapes eight skinless links every 2½ seconds, ready for packaging. This eliminates use of casings and the linking operation. The saving in expense makes a more competitive finished product.

An entirely new installation now produces smoked canned hams, luncheon meats, and similar products that formerly could not be smoked as a practical matter. Smoke is produced by burning hardwood in a generator, and is forced into a stainless-steel cabinet in controlled volume. The smoke particles within the cabinet are electronically charged by 12,000 volts. When the hams move through on a conveyor, at a rate of 7,500 pounds per hour, they come in contact with the electrically charged smoke which penetrates the meat, adding color and flavor.

Tremendous progress toward the fast and efficient handling of heavy and bulky materials has been made as our engineers have succeeded in eliminating a lot of back-breaking labor. A good example is in the beef-curing rooms. Formerly, each separate piece of beef had to be taken out of one vat and put into another by hand, a process called "overhauling." Now a specially designed tractor moves in to grab a curing vat of beef cuts. Steel clamps encircle the heavy vat and raise it. The tractor operator tilts the full vat over an empty one, and the pickling liquid is poured out. The vat is further tilted and the beef is dropped out without any hand labor. This process is performed three times during the curing period, after which the meat is dried and packaged as sliced dried beef.

The final shipping assembly of hundreds of finished items from scores of plant departments is a highly detailed operation. Each item must be weighed, checked, and assembled to complete thousands of orders a day. A new central-pack installation has been developed to make this operation fast and accurate. Horizontal and inclined conveyors speed the product right to the loading docks for refrigerated trucks and rail.

Several of our coolers for beef cuts have been completely modernized, with new overhead rail system and walls of tile brick. Power saws are now used in these coolers to cut the sides of beef into primal parts—an operation formerly performed by hand on a block.

Canned meats represent another important segment of production of branded items. A machine now automatically and simultaneously slices seven lengths of vienna sausage to exact size and packs them in a can, an operation formerly done by hand. Up to 15,000 cans an hour can now be packed.

A tremendous amount of quantity cookery of a variety of ingredients is done in the canning kitchens. Stainless-steel mobile cook tanks, each capable of handling 750 pounds of meat or vegetables, are now used for easy moving without extra handling of the contents. Some ten tons per hour can be cooked in this manner.

One of the newest automatic lines is for packing baby food in glass jars. We have a joint arrangement with Gerber to produce chopped and strained meats for babies. A conveyor brings up cartons of empty jars which are vacuum cleaned, inspected, and sterilized before filling. The preliminary operations are keyed to a filling capacity of more than five jars per second. An x-ray unit recently installed is one example of the rigid quality control maintained in processing of baby food. Inspectors are able to spot any jar not coming up to prescribed standards.

New packaging machines accurately fill and seal up to 130 one-pound cartons of lard each minute. Armour scientists have developed a modified lard with greatly improved baking qualities. The molecular structure of the lard is actually changed by a process fully covered by patents and available for licensing.

Drums of lard are handled by a tractor with special clamp lifts that pick up a 450-pound drum of lard as easily as a person lifts a can of Treet. The truck raises the drums 10 feet and stacks them two high directly in a railroad car, at the same time towing two trailers loaded with 12 additional drums. That means one man is able to move nearly three tons of lard while he is sitting down.

An example of handling completely mechanized materials is a master canned-food conveyor 100 feet long intersected by six feeder conveyors. When working at full capacity, a case of product comes off the packaging machines nearly every second. By a system of mirrors and an electric eye, movement of the cases is regulated better than by any traffic policeman.

Modernization has not been limited to plant operations. The press of a button has enabled us to streamline office work as well. Machines at one plant perform such jobs as the preparation of some 6,000 invoices weekly, the calculation and printing of a payroll for 3,000 employes, figuring all deductions (including union dues and annual withholding-tax statements as required by law) profit or loss on more than 25,000 items per week, and also work on sales analysis and other special assignments.

THE ECONOMIC IMPACT OF TECHNOLOGY ON FARM COMMODITIES: THE CASE OF ORANGES

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Minute Maid Corporation

Origin

THE origin of the orange-concentrate segment of the citrus industry can be traced directly to the demand by the military in World War II for a shelf-storage orange powder of high quality. This does not imply that the subsequent development of the industry was independent of the continuing improvement in sub-zero refrigeration techniques, of population growth, and of high consumer expenditures. All of these have played a large part in the truly explosive growth of concentrates.

But, given that the environment has been favorable for growth, the actual birth still seems to have been accidental. In the late days of World War II, National Research Corporation developed what seemed to be a satisfactory shelf-storage orange powder. A government contract was secured, a company (Vacuum Foods Corporation) was set up, and production was started. Production was hardly underway when the war ended. The contract terminated with the war, of course.

However, low-temperature high-vacuum concentration was a step in the manufacturing of the extremely hygroscopic shelf-storage powder. Having contracted for certain amounts of raw material and having built a plant, the management of this small company decided to try to market a frozen form of the concentrated juice obtained in the powder process. Ninety thousand gallons of juice were frozen in 1945-46. From this small beginning the present 70-million-gallon industry has sprung.

Impact

The rapid growth of concentrates has inevitably affected the whole citrus industry. The consumer, the grower, regional production patterns, and the marketing organization have all felt and are still feeling the impact of this vast expansion in concentrates.

Consumers

On the consumption side, the relative importance and relative prices of different forms of oranges have undergone radical changes.

In the decade since the introduction of frozen orange concentrate, consumers have drastically reduced their purchases of fresh oranges, have reduced somewhat their buying of canned single-strength orange juice, and have been, to put it mildly, enthusiastic in their acceptance of frozen orange concentrate. Table 2, of course, explains part of this en-

TABLE 1. CONSUMPTION (MM BOXES)

Year	Fresh	Processed	
		Shelf-storage	Frozen concentrate
1944–45	87.7	24.1	0
1953–54	52.5	19.8	49.8

TABLE 2. PRICES OF DIFFERENT FORMS OF ORANGES

Date	Oranges (¢/dozen)	Canned Juice (¢/46 oz.)	Concentrate (¢/6 oz.)
February 1950	43.3	36.2	26.4
February 1956	48.0	33.1	16.7

thusiasm. The price of concentrate has been greatly reduced, while prices of canned orange juice and of fresh oranges have been about steady. Reinforcing the effect of price reduction, improved quality, advertising, convenience, and availability of home and store freeze boxes have all undoubtedly played a part in the shift to concentrated juice.

Growers

In examining the impact of the development of the concentrate industry upon the grower of oranges, one must bear in mind that there are two major producing areas. Concentrating is relatively unimportant in California (about 3.5 million gallons annually), but it may be that increased competition from Florida in the form of concentrate has been, along with real estate prices and high cultural costs, a factor in the startling decline in California orange production.

When one considers the Florida scene, it is apparent at first glance that the vast growth of concentrating with its huge new market for Florida oranges has not led to stability in prices or in income for the grower. Table 3 shows the extreme variations involved. But Table 3 does not tell the whole story of price uncertainty. Weekly average price paid by concentrators on the spot market fluctuates rather wildly at times, and this within season fluctuation of the price of raw fruit may very well be a major factor affecting the whole organization of the citrus concentrating industry. This problem of intra-seasonal fluctuation in the price of raw fruit will be encountered again in the discussion of the organization of the industry.

The continuing high level of new plantings and the price per acre of mature groves ($2,000-$3,000 reported) would indicate, however, that this

TABLE 3. FLORIDA ORANGES

	Per box	Net returns per acre	Acreage	Total	Movement of trees from nurseries
			(thousand)	(million)	(thousand)
1945–46	$1.89	$355	265	$94	800
1947–48	0.13	27	280	8	630
1949–50	1.62	314	301	95	1,091
1951–52	0.19	46	322	15	665
1953–54	0.67	180	330	59	1,158

price and income uncertainty is bearable. The possibility of high average returns seems to be good enough to encourage growth. Also, in addition to expecting high average returns, the grower has at hand various methods to decrease some of this price and income uncertainty. Cooperative arrangements, leases, and long-term contracts are frequently used.

Regions

The Florida citrus industry seems to have a natural advantage in the production of orange concentrate not enjoyed by the principal rival industry in California. The very large expansion of Florida production combined with the shift in time of marketing made possible by the storability of orange concentrate have undoubtedly played a part in the decline of California as an orange producer. However, the impact of concentrate upon the California grower is confounded with the effects of real estate prices and growing cultural costs, and it does not seem possible to do other than to consider that a combination of causes has led to California's decline. Table 4 gives some idea of the shift (in the past few years) in the relative importance of the two major orange producing areas, while Table 5 indicates the growing competition faced by California Valencias during their summer marketing season. The degree of this competition becomes more apparent when one stops to think that, except for pipeline carryover, each annual pack of concentrate is usually marketed before the beginning of the next processing season.

TABLE 4. REGIONAL ORANGE PRODUCTION (MILLION BOXES)

Year	Florida	California
1940–41	29	51
1944–45	43	60
1949–50	59	42
1954–55	88	39

TABLE 5. END OF JUNE CONCENTRATE INVENTORIES AND CALIFORNIA VALENCIA PRODUCTION

Year	Concentrate inventory	Valencia production
	(million gallons)	(million boxes)
1951	22	31
1952	28	26
1953	23	29
1954	35	18

Organization

The Florida concentrating industry is now equipped and financed to process at least 50 million boxes of oranges each harvesting season and to transport, warehouse, and merchandise this product over a full year. The need to process in a rather short period and then to carry a large inventory inevitably leads to large investments in plant capacity and to high demands for working capital. For instance, end-of-June inventories for the past few seasons could be valued conservatively at about $135,000,000 each year. Computations based on rather meager information, indicate that the industry currently has about $100 to 150 million invested in plant and equipment and demands about $200 million annually for working capital.

This need for capital, the concentration of the primary production area, and, perhaps, certain institutional factors have led to the growth of rather large processing firms. These firms are faced with a sharp degree of uncertainty at two levels: (a) in the price that they must pay for fruit and (b) in the price that they will be able to ask for the finished product.

Three major types of processing firms have evolved, (1) cooperatives, (2) subsidiaries to larger organizations, and (3) independents. All of these firms face the previously mentioned uncertainties and attempt to solve them, or to live with them, in rather different ways. But before discussing these modes of adjustment, it might be well to deviate a bit to talk about the sources of the uncertainties involved.

On the one hand, there are not enough oranges in the average year to satisfy the demands of the processors without leading to (what processors would term) high prices. The per capita production of oranges is just possibly remaining constant. But per capita income is going up. In addition to this, there is fluctuation in the annual production of oranges, and, possibly the desire for relative growth on the part of the processors. The apparent pressure of demand upon supply changes, frequently, within the processing season. There are no old inventories, generally, to cushion the pressure of demand upon supply. Prices of raw materials fluctuate

sharply within season with sometimes disastrous effects upon recently acquired inventories.

On the retail end of the processing and marketing line, the orange concentrator is faced with extreme competition for space in the display case of the retail grocer. It is to be assumed that the competition is most extreme, of course, for space in the display cases of the large supermarket chains.

Faced on the one hand with uncertainty about the development of raw-material prices both from year to year and within year, with the need to maintain (and perhaps the desire to expand) his share of the market, the processor is hard put to devise procurement and inventory policies.

Procurement policies are many within the industry, but they usually contain some element ensuring that the processor involved will have a good chance to obtain his fruit at least as cheaply as his major competitors obtain theirs. The need to gain and maintain access to display boxes makes it imperative that those processors who market their own product obtain a sufficient supply of fruit at prices not significantly higher than their competitors to allow them to "stay competitive."

This desire for fruit at average prices leads to various forms of vertical integration: forms ranging from outright ownership of large grove holdings, through leases and long-term contracts, to profit-sharing plans and cooperatives.

(The development of the concentrate industry, then, is leading to changes in the pattern of grove ownership and grove management.)

In the concentrating industry at present, inventories are about as great a source of concern as are prices for raw fruit. The fluctuation of raw-fruit prices within and between season, the capital needs of the industry, and the different forms of vertical integration employed therein, lead to a present policy, it seems, of going into each season with only pipe-line quantities in inventory. There is, of course, a fear that new season prices will be such that inventory losses will occur. In addition, some firms, due to their form of vertical integration, are permitted and almost required to sell all their product in a given year. Cash needs for payments to member growers must be met, and losses, if any, can be shared among these members. As the new season approaches each year, it may well be that managements of the various firms become quite anxious about the size of inventory and about its dispersal among the firms in the industry. In 1950 for instance, a major firm in the industry, in an effort to dispose of its large holdings before the 1950-51 season opened, reduced its prices so drastically that profit in the industry for that year was severely reduced. (I know of at least one firm that made a negative profit that year.)

Summary and Aside on Other Citrus

The most obvious and possibly the most important example of the impact of technology upon the citrus industry during the last twenty years has been the development of frozen concentrated orange juice. This segment of the industry has grown from a minute initial size in 1945-46 to a giant that now uses somewhat more than $100 million in fixed plant and equipment and that demands some $200 million of operating capital each year. Current production is slightly in excess of 70 million gallons annually, a truly explosive expansion of the 90 thousand gallons produced in the first year of operation.

The industry has succeeded in giving to the consumer what seems to be a highly acceptable orange product at prices that have undergone significant reduction in absolute magnitude in the face of the inflationary rise of other prices.

The record is not quite so cheerful if one considers price and income stability of orange producers and profit and stability of the firms involved in the industry. Neither price nor income instability seem to have discouraged new entry into orange growing, however. New plantings are, on the average, very high and the price of mature citrus acreage continues to rise. Price and cost uncertainties seem to have led to vertical integration and consolidation among the processing firms.

The title of this paper restricted the discussion of the impact of the low-temperature evaporation and freezing process upon the citrus industry to the orange segment thereof. If time and title had permitted it might have been interesting to explore the effect of the introduction of frozen concentrated orange juice upon the market for fresh grapefruit. Some students of marketing maintain that the observable decline in the demand for grapefruit can be traced to the substitution for grapefruit as a breakfast item of the much more convenient frozen orange concentrate.

On the other hand, if interest centered in the impact of technology upon legally constituted marketing institutions, a very good example would be at hand in the impact of the marketing of frozen concentrated lemonade upon the marketing of fresh lemons. The ease of storage of frozen lemonade and the potential sources of unregulated supplies of raw fruit will undoubtedly have some effect upon the institutions that have developed for the marketing of California lemons.

THE ECONOMIC IMPACT OF TECHNOLOGY ON STRAWBERRIES

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THE subject is an ideal choice for discussion at this meeting. During the past several years the central coast counties of California have come to be the leading strawberry-producing area in the nation. Within a radius of about 50 miles from this location can be seen the greatest concentration of strawberry production that the world has known. This development has been a result of modern technology applied to strawberries.

The earliest known application of technology to strawberries occurred several hundred years ago. Indians of Chile, South America, are reported to have made selections from among the wild strawberries which grew along the beaches, of plants which produced fruit of unusual size. A few of these plants reached France in 1714 where they were crossed with the meadow strawberry of Eastern North America, which had preceded the Chilean strawberry to Europe. The modern strawberry developed in Europe from these crosses.

Varieties originated in Europe were introduced into the United States and by about 1800 there was some commercial production around the largest cities. By about 1850 some of the European varieties were being grown rather extensively. Most of these early varieties, however, were soft-fleshed and had little carrying quality so that they had to be marketed locally.

About 1851, the first productive firm-fleshed variety, the Wilson, was developed. The Wilson would stand shipping and made commercial production in the South possible. Additional varieties were introduced in the late 1800's and early 1900's which permitted the extension of strawberry culture into areas where previously they had not been produced successfully or at all. The plant breeder has developed varieties for almost every climate, soil, and location. As a result the strawberry has become one of the most widely cultivated fruits in the world.

In recent years, many new varieties have been introduced by federal, state, and private plant breeders who have devoted their efforts to producing varieties of better size, color, flavor, productiveness, which have better adaptability to a particular location or area, or to a special use such as local fresh market, distant shipping, or processing, or which are more resistant to disease or insects. Probably over half of this year's production in the United States consisted of varieties that were unknown 15 years ago. Witness the Shasta and Lassen and similar varieties in California, the Northwest in Oregon and Washington, the Robinson in Michi-

gan and other North Central States, the Tennessee Beauty in Tennessee, Kentucky, and surrounding areas, the Klonmore in Louisiana, the Florida Ninety in Florida, the Pocohontas, Dixieland, and Albritton in the South Atlantic States, and the Sparkle and Jerseybelle in New Jersey, to name some of the more important.

In some areas these introductions have provided growers with a choice of two or more varieties, each of which may have certain advantages. In some cases these varieties may ripen at different periods, enabling the grower to lengthen the harvesting season as well as to spread his risk of possible loss from unfavorable weather conditions.

With a few notable exceptions, the newer varieties do not appear to have brought about greater sustained yields. A comparison of average yields over the five-year period from 1950 through 1954 with those of 15 and 30 years earlier shows very little change for most States other than Michigan and the Pacific Coast States. The greater use of irrigation in Michigan in recent years probably accounts for at least part of the moderately heavier yields there.

Oregon and Washington yields have trended upward in the last few years following substantial plantings of the Northwest variety, which is a heavier producer than the Marshall. In California, however, outstanding crop yields have been obtained by the use of new varieties. The Shasta and Lassen, developed by University of California plant breeders, have produced yields double those of varieties grown earlier. The State average during the period 1950-54 was more than six tons per acre. Yields of 15 to 20 tons per acre are not uncommon in the better plantings. Unfavorable weather can and often does do some damage to the crop early in the season but because of the long fruiting period, extending over about seven months in the costal areas, the loss of one or two weeks' production, which could be ruinous in other areas, is of much less consequence to the California grower.

Other technological developments in the production field include the more effective control of diseases and insects through new materials and techniques. The use of irrigation, which is necessary in all California areas, has spread to some extent to other States, with the Northwest, Michigan, and Long Island probably having the greatest acreage under irrigation at present. The extreme heat wave that struck Michigan about the middle of June this year demonstrated the value of irrigation, as fields not equipped suffered much more severe losses than those that were irrigated. The use of irrigation has also served early in the spring to avoid damage from frost on cold mornings.

The first commercial strawberry production, as has already been mentioned, was largely confined to areas immediately surrounding the larger

cities. The extreme perishability of the fruit and the lack of rapid transportation effectively confined distribution to the local market. With the steady expansion of railroad mileage in the late 1800's and the development and improvement of refrigerator car service it became possible to ship berries over long distances and made nearness to large consuming centers less of an advantage. Production spread further and further from the principal markets, particularly into the South. The earlier maturity of the southern crop enabled growers in these areas to put their berries on the market ahead of the more northern crop. Premium prices for early berries frequently more than offset the higher transportation expense. Often the southern areas were better adapted to strawberry growing and labor and other costs usually were lower.

During most of the first half of the present century the Southern and South Central States of Tennessee, Missouri, Arkansas, Louisiana, Florida, North Carolina, Virginia, and Maryland were the major producers. Carlot shipments built up to a peak of from 12,000 to 19,000 cars annually during the 1920's, and exceeded 18,000 cars in four of these years. Motor trucks have since cut into rail volume very sharply and at present California and Louisiana are the only states moving important quantities by rail. The rise of the motor truck as a long-distance carrier during the past 30 years has been a dominant technological development in the transportation of food.

Improvements and refinements in refrigerator car construction in recent years have aided in better deliveries. Among these have been the installation of fans for providing forced air circulation around and through the load, better insulation, and improved couplings, undercarriages, and trucks. Many of these same advances have gone into the construction of refrigerated motor trucks and trailers.

Air transport has been used only to a very limited extent up to the present time. Its use has been confined mostly to shipments made at the beginning and end of a season when the quantities available or desired for shipment to a distant market are too small for carlot shipment or when unfavorable harvesting weather or other special situations interrupt the normal flow to the markets and temporary shortages of supply occur. Precooling at shipping point, when used with fast surface transportation, has proved to be as advantageous and somewhat less costly than air shipment. A precooling technique in general use in California but apparently little used elsewhere is that of delivering the berries from the field during the day or evening to cold storage plants where temperatures are brought down to the desired point during the night. In the morning the cars and long-distance trucks are then loaded by the storage company crews.

The most far-reaching technological development in recent years affecting strawberries has been the utilization of the freezing technique for

preserving the fruit. Although the principles of preserving foods by freezing had been known for many years, their practical application required much experimentation and research. The greatest obstacle was overcome in the late 1800's with the development of mechanical refrigeration which made it possible to create and maintain low temperatures under controlled conditions. A few frozen strawberries and other berries and small fruits were being packed about the beginning of the century for use by manufacturers of preserves and ice cream and by bakers. About 1909 the preservation of fruits, principally strawberries, by freezing became a commercial industry in the Northwest. By the late 1920's the frozen strawberry pack in the Northwest was running about 25 to 40 million pounds annually. This was almost entirely in barrels or other large containers for use by food manufacturers.

About 1929 the packing of frozen strawberries in small containers for household use began. Development in the early years was rather slow, but since World War II there has been a rapid increase as facilities for distributing, storing, and merchandising have expanded and as consumer acceptance has increased. Strawberries have been the most successful of all frozen fruits, probably because in its use the product retains so many of the natural characteristics of the fresh product that it is often almost indistinguishable from it. By 1955 the retail or consumer pack totaled almost 125 million pounds while the institutional pack reached nearly 150 million pounds. The total frozen pack was greater than that of any other commodity with the exception of orange concentrate.

Technological progress in one field or in one direction often requires and must wait upon progress in other fields or directions in order to contribute its maximum benefit. Heavier production, in itself, may have an adverse effect on price more than offsetting lower unit costs of production. The development of a new product, no matter how great its merit and consumer acceptance, is of little value unless it can be produced and marketed at a profit.

The expansion in the freezing of strawberries and other foods has brought about the need for dependable sources of supply, for better and more efficient methods of preserving, including equipment, packaging material, and techniques, for more "sharp" cold storage warehouse space in both producing and distributing centers, for adequate specialized transportation facilities, for increased retail storage and display space, and for greater home freezer capacity, to name but a few of the more important necessary complementary developments. All of this involves an enormous investment all the way from producer to the consumer household.

The introduction in 1945 of several new varieties developed by the University of California came at an opportune time for California to enter

into the strawberry picture. Previous to World War II California had been a rather minor factor, supplying its own needs and shipping a few hundred cars each spring into the Northwest and Intermountain area and a very few cars each fall into Chicago and New York. Except for a little preserving, there was no important outlet other than the fresh market. During the War, the resettlement of many workers resulted in acreage and production dropping to a point where local markets were inadequately supplied and in 1945 there was not a single car loaded for shipment out of the State. Acreage and production in other states also dropped sharply at the same time, largely due to labor sources being drained away by war industry at higher wages. The fresh market demand took most of the crop and freezing was confined mostly to Oregon, Washington, and Louisiana.

With the end of the War, acreage gradually increased but in most states it did not reach its former proportions. Prices held up fairly well but labor shortages, droughts, and freezes were discouraging factors. In California it quickly became evident that the new varieties were well adapted to the soil, climate, and cultural methods, and acreage increased steadily from year to year. By 1950 California had become the leading producer in the nation. Shipments were being made to many out-of-state fresh markets which had never received California berries. From a negligible volume a very few years before, the California frozen strawberry pack had reached nearly 40 million pounds. During the current year, interstate rail and truck shipments of fresh strawberries will reach a record of close to 3,000 cars and intrastate movement will account for another 2,500 cars. The frozen strawberry pack will probably be in the neighborhood of 175 million pounds.

Favorable prices for both fresh market and processing strawberries during the past few years have encouraged new plantings in other areas, particularly the Northwest, the South Central States, and Michigan. Unfavorable weather from time to time, however, has caused some losses of acreage and made production uncertain. California has emerged as the most dependable source of large supply, as well as having a harvesting period covering many weeks.

Advances in processing operations have been too numerous to mention in detail. More efficient, faster, and more fully automatic machinery is constantly being introduced for all operations from the time the fruit is received until it has been processed, packaged, and stored. Better, stronger, more convenient, and more attractive packages have come into use. New techniques are continually being added all along the line as creative imagination and research find better ways to do things. These advances have generally reduced costs per unit of product, provided better quality control, and reduced fatigue of labor, among other things.

A few new products have been brought into commercial production, notably strawberry concentrate and strawberry essence.

The requirements for greater storage capacity in which temperatures of zero or below could be maintained have been met by increasing the capacity of existing storages and by the construction of new storages. Recent warehouse construction has been designed to permit use of modern handling equipment and is generally better adapted to the requirements of frozen foods. There are more in-transit warehouses located at convenient points. Railroads now have in service about 2,500 mechanically refrigerated cars capable of maintaining temperatures of zero or below on transcontinental or other long hauls. About half of these have been constructed and put into service within the last year. The trucking industry is reported to have around 5,000 mechanically refrigerated truck trailers.

In the retail field, most stores now have specially designed self-service frozen food cabinets, but in many of these, especially the older stores, cabinet space is very limited. Most of the more modern stores have been designed to provide extensive cabinet capacity. The growing list of frozen foods and food products being produced, however, is causing ever-increasing competition for a place in the cabinets. Many in the frozen-food industry consider the lack of adequate cabinet space to be a major bottleneck restricting further rapid increases in production and distribution of frozen foods.

Home freezer production and sales have continued at a fairly steady rate in recent years, thereby providing greater capacity in the home for the storage of frozen foods. Also, home refrigerators with larger compartments for frozen foods are more common. The number of locker plants, however, has decreased in the last few years, probably because many of their customers turned to home freezers.

A comparison of the strawberry industry prior to World War II and as it is today shows some of the far-reaching effects that modern technology has had on the industry itself. Particularly interesting are comparisons of the years 1942 and 1955. Production in both years was nearly identical and was only slightly under the record heavy volume in 1929. The year 1942 was the last year of heavy production before conditions brought about by the War resulted in curtailment of culture of the crop. By 1955, production had recovered to within 2 percent of the 1942 volume.

Prior to the War, production in most states except the Northwest was utilized very largely by the fresh market. Processing had for a number of years been the principal outlet in Oregon and Washington but in other states this method of disposition was mostly used during periods of low fresh-market prices and near the end of the season when other areas closer to the centers of consumption had taken most of the fresh-market

demand. Since the War, and particularly in the last few years, the demand for berries for processing has made this usage a factor of importance in all areas.

In 1942, the fresh market utilized about 80 percent of the total production, processers about 15 percent, and about 5 percent was not marketed. In 1955, with a crop of almost equal size, less than 45 percent went to the fresh market and a little more than 55 percent was processed. On a weight basis, less than 65 million pounds went to processors in 1942 and about 253 million pounds in 1955.

With an alternative outlet for a major part of the crop at an established price the grower no longer depends almost entirely upon the fresh market. In periods of heavy supply and relatively low fresh-market prices the marketing of large quantities through processing channels has kept much fruit off the fresh market and aided in maintaining prices in the fresh market above disastrously low levels. In some areas, particularly the Northwest and California, freezing is the primary rather than the distress outlet for the production.

The average price received by growers in 1942 for strawberries in the fresh market was approximately 9¢ per pound. In 1955 the average price was approximately 26¢ per pound. Prices paid by processors averaged 8⅝¢ per pound in 1942 and were just double that in 1955. Averages for each individual state paralleled very closely the national average.

The change in utilization of the crop has been accompanied by a shift in areas of production. Production since the war has greatly increased in the Pacific Coast States. In 1942, the three Pacific Coast States accounted for 17.5 percent of the total United States production and in 1955 for 62.5 percent. California alone increased from 4 percent in 1942 to nearly 35 percent in 1955. The Mississippi Valley group of States including Louisiana, Arkansas, Oklahoma, Missouri, Tennessee, and Kentucky dropped from 42 percent in 1942 to 12 percent in 1955. In this case, 1955 is not quite a fair comparison for this group because a combination of reduced acreage and low yields brought a smaller crop than usual; the average in most other recent years has been a little more than 20 percent. The group of states from North Carolina to New Jersey dropped from 12 percent in 1942 to only 4 percent in 1955. Most of the other states have also shown declines except for a moderate increase in Michigan.

Total returns to growers for both fresh-market and processing strawberries in 1955 exceeded $92,000,000, about 135 percent more than was received in 1942. Because of the shift in producing districts, the Pacific Coast States have benefitted more than other areas. In California, where strawberry growing can almost be said to be a new industry, the value of the crop jumped from slightly more than $2,500,000 in 1942 to more than

$33,500,000 in 1955. Oregon had a five-fold increase from slightly more than $2,500,000 to more than $13,000,000 and the Washington crop value more than tripled from $2,000,000 to $6,500,000. For the three states combined, returns to growers went from less than $7,500,000 in 1942 to nearly $53,500,000 in 1955. The Michigan crop in 1955 brought $7,500,000, nearly three times the value of the 1942 crop. New York and Tennessee production doubled in value. Other states have shown smaller increases in crop value and some have shown substantial declines.

The shifts in producing districts and in utilization have required adjustments in land use, labor requirements, marketing, and transportation. Growers in some areas have tended to specialize in strawberries as a single crop rather than as a sideline or cash crop. This is particularly true in California, where stawberry culture is an intensive operation and a relatively small acreage requires the full time of one or more persons.

The lighter volume moving to the fresh market has resulted in less demand for and usage of crates and cups and less business in this commodity by shippers, wholesalers, and retailers. Transportation demands are much lighter in most states but have become heavier in California where an express car supply problem sometimes exists because the peak of the strawberry movement closely coincides with the peak of the cherry season. The years of 18,000 cars of strawberries a season shipped by rail have long since passed. Trucks first cut heavily into rail hauls until by 1942 rail shipments were down to 6,628 cars. Since the war the lighter fresh-market utilization has cut into both rail and truck movement. Rail shipments this season will probably be just a little more than 3,000 cars, mostly from California.

The growing frozen-strawberry business has required extensive new plants or enlargements of existing ones, much equipment and machinery, more zero cold storage and transportation capacity, more containers, and many other related supplies and services. The large investment in plant and equipment and in raw product, labor, and containers as well as storage, insurance, and other costs involved in carrying the end product over a marketing period that may cover many months requires much greater financing than does the fresh market with its rapid turnover.

In the frozen-strawberry market sales have practically doubled in the past six years. There has been a gain each year, averaging about 20 million pounds. Disappearance in 1949 was approximately 133 million pounds and in 1955 it had reached 251 million pounds. The latter figure does not include 13.5 million pounds of frozen strawberries imported from Mexico where the freezing of strawberries for the United States market was just in its infancy in 1949. In 1955 production caught up to and slightly exceeded disappearance but not sufficiently to weaken the market. This year the

industry is well on its way to establishing a new record pack, substantially larger than last year. A tremendous increase in California and a large increase in the South will more than offset the sharp drop in the Northwest. Cold-storage holdings in the nation at the end of July were 80 million pounds more than a year ago. Prices to growers have declined, especially in California, where the current price is mostly 12¢ per pound compared with 17-18¢ a year ago and 17¢ at the start of this season.

The trends in production during the past several years have taken place under conditions of generally favorable prices. If a period of less favorable returns should occur there undoubtedly would be some adjustments in acreage. The extent to which such adjustments might occur in any area would depend largely upon the ability of growers to produce at a profit and the attractiveness of alternative crops.

The probability that consumption can be increased above that of recent years would seem to be a reasonable expectation. During the ten years beginning with 1920, per capita consumption of fresh strawberries averaged 4.1 pounds, farm weight basis. No comparable figures are available for frozen strawberries, but consumption obviously was very small. During the 1930's there was a slight decline in consumption and during the war it declined to a very low figure. Since then, it has been increasing gradually, with most of the increase occurring in frozen strawberries. In 1954, the last year for which figures are available, consumption was 1.3 pounds of fresh berries and 1.1 pounds in frozen form, or a total of 2.4 pounds.

Consumption of strawberries in frozen form probably increased to at least 1.2 pounds in 1955. This year, we already have sufficient figures on movement of fresh strawberries to know that there was a greater consumption in fresh form and there is every reason to expect that the increase in the frozen form will not only continue but that the lower prices may even accelerate the rate of increase.

If per capita consumption could be built back up to the 4.1-pound level of the 1920's, our present population would consume about 675 million pounds, or about 20 percent more than this year's record production. This does not appear unreasonable although several years time would be required. The trend in consumption in recent years has been upward and the fruit is now readily available in frozen form the year around as well as in fresh form much of the year. Consumption in the 1920's was very largely during the spring and early summer months when fresh strawberries were in heavy supply.

Technological progress has had a major influence on the strawberry industry for many years. The development of new and better varieties, the growing efficiency in method of production, preservation, and distribution, and the introduction of new products to fill new demands have cre-

ated an industry very greatly different from that of 100, 50, or even 15 years ago. This progress goes on at an accelerated rate. We are told that we are on the verge of the discovery of practical methods of sterilization by radiation. The effects of these and other future developments may bring changes in the industry as striking as those of the past.

I could not close this discussion without some comments on comparable developments in the technology of market reporting by my own agency, the Market News Service, as applied to strawberries. Perhaps it is a coincidence that the first of the long list of commodities now reported by the Service was strawberries. In 1915, in an effort to assist in the marketing of perishable crops from areas of surplus production, an office was opened at Hammond, La., and the first market news report was issued there on March 27, 1915. The information provided, while far less complete than present-day reports, was much more comprehensive than even the best informed dealers had been able to obtain up to that time. From this beginning, additional services were soon added. Permanent offices were established in the principal cities to report on prices, supplies, and other conditions. Temporary offices were set up in the major producing and shipping districts during the marketing period. Arrangements were made whereby railroads reported carlot shipments each night to the Washington office for early morning dissemination. Leased wire intercommunication among offices speeded the exchange of information. Similar services were developed for other agricultural commodities until nearly all crops of any commercial importance are now reported.

My own first field assignment was on strawberries at Chadbourn, N.C., in 1931, at a time when that state was a major strawberry producer. Trucks were beginning to cut rather heavily into rail movement at about that time and refinements had been made in market news reports to include truck volume in a number of producing areas and terminal markets. Additional truck coverage has been added from time to time. About a year ago a special daily report was begun showing the combined daily rail and truck receipts at 32 important markets by commodity and state of origin.

In 1951, when California was becoming an important factor in the national strawberry marketing picture, the San Francisco office, at the request of growers and shippers, began a special daily report containing all strawberry market information available. The following year, again at the request of and with the cooperation of the industry, we added an entirely new feature. This was the tabulation and publication on a weekly basis of fresh strawberry deliveries to California freezers throughout the season, along with a summary of prices paid to growers. This enabled the frozen strawberry industry to chart its own progress on a current basis

for the first time. The next year, the Portland and Seattle Market News offices instituted a similar service for Oregon and Washington. Since the three Pacific Coast States pack about 80 to 85 percent of the national total, these figures make it possible to anticipate during the season with a fair degree of accuracy what the national pack is likely to be. More recently, Market News Service offices in Baton Rouge, La., Fayetteville, Ark., Louisville, Ky., and Benton Harbor, Mich., have tabulated at the close of their seasons the quantities received by processors in those states. This brings the total coverage up to about 90 percent, leaving Tennessee as the only important state for which in-season figures are not available. Additionally, each of the seven Market News offices mentioned prepares each Wednesday a brief comment on the progress of harvesting and marketing in its area for interchange with the other offices.

Whatever changes the future may hold for the strawberry industry, the Market News Service hopes to continue its service to the industry and to cooperate with it.

DISCUSSION: THE ECONOMIC IMPACT OF TECHNOLOGY ON MEAT PACKING

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The presentation of some of the major features of one company's program, in turning to automation to solve marketing-cost problems, has certainly been both enlightening and refreshing. All too frequently the problem of marketing costs has been in nearly the same category as our constant companion—the weather. Need I say more? We have talked and written long and arduously—yes even expectantly—but without seemingly ringing up much more on the accomplishment side of our own score card.

Perhaps the problem we economists have faced is that we, in fact, are too distantly removed from the real action point. We are in the spectators stand rather than being in the game. The architect and the industrial engineer are in the orchestra pit. Meanwhile we sit back reflect, theorize, and all the while rather abjectly tap our feet to the ensuing music. In a case like that outlined by Miller's presentation, I think there is certainly also room, at least on our part, for applause. But I, for one, shall feel much more comfortable when more of us get out of the stands and into the game and begin participating in charting action-marketing plays.

First I should like to comment on a few technical points in Miller's paper. Livestock, dairy and poultry products will, over the long pull, form a further increasing proportion of the future cash receipts from farm

marketings. Emphasis upon the shape and size of the waistline—needless to say—will help contribute much in that direction. But there is far from a headlong rush. According to USDA statistics on cash receipts, livestock and livestock products comprised 57 per cent of the cash farm income in the 1935-39 period. In 1951 the figure stood at 60 per cent, but by 1952-53-54 it was back down to 56 per cent. The increase in income from livestock is perhaps slower than Miller's first comments would incline us to believe.

The statement that the "importance of meat animals as an income contributor has been accomplished despite a decrease in the demand for meat" is also disturbing. The consumer's dollar expenditure on meats may have declined in total, but this may in itself reflect no basic change in meat demand per se. Rather it may only be a function of the shape of the demand curve for these particular products. If we assume something less than unit demand elasticity with price for meats, which seems to be borne out by recent studies by Karl Fox and others, then increased supplies of meat will be taken only at the expense of more than proportionate reductions in retail price. These reductions then would necessarily result in a lower total consumer expenditure on meat products. We have had markedly increased supplies. The USDA statistics show per capita beef consumption up 44 per cent, veal up 25 per cent and pork 9 per cent from the 1935-39 average. The only decline was in lamb and mutton—a drop of 28 per cent. Let me add that these are approximate percentages only. In total per capita consumption, these meats were 23 per cent above the 1935-39 period. Added to this, poultry consumed was a whooping 85 per cent ahead of the 1935-39 level.

Thus far income as a shifter of the demand curve has not been given consideration. Let me again rely on Karl Fox's recent estimates. He concluded that a change of 1 per cent in disposable per capita income resulted in an 0.87 per cent change in price in the same direction. From the 1935-39 years to 1954, per capita disposable income advanced by 205 per cent. Per capita meat expenditures should have advanced accordingly by 178 per cent. Simultaneously population mushroomed by 27 per cent. Meat expenditures (assuming constant supplies) would have therefore made a total advance of 228 per cent. Yet, even in the face of larger supplies, total meat expenditures were up 247 per cent. This suggests that the demand curve, contrary to a decrease, actually shifted in the direction of an increase. Such a conclusion—although I would not vigorously defend it without further analysis of the demand factor—at least has the virtue of being in accord with consumer income-expenditure studies and other related data.

We can hardly expect the proportion of income expenditure on each

category of consumption to remain constant or fixed through time. As Bob Walsh of the USDA commented in the meetings last year, on the basis of Engel's law we would expect the percentage of income devoted to necessities to decline as income rises. Therefore if we are maintaining the percentage spent for food, as it certainly appears we are, a successful job of marketing and merchandising of food products is apparently being accomplished. In 1954 we spent 25 per cent of our income for food rather than 23 per cent as in the 1935-39 period. Of course a considerable part of the success may be due to increased services now built into the products. In fact some feel that all the percentage increase is due this services element.

Automation is certainly needed as greatly, if not more so, in the food industry as elsewhere in the economy; and the livestock marketing system perhaps more than any other needs to be reappraised all down the line. Consumer-preference studies by Texas A & M, Colorado A & M and the University of Arizona have definitely raised questions about the system of beef grading. The same research finds evidence of shortcomings, or at least considerable consumer dissatisfaction, with self-service meat markets. John McNeely's studies at Texas A & M of livestock auctions have found areas of diseconomies in the operations of those marketing agencies. His current research on the Ft. Worth stockyards with George Turner of the USDA already has revealed gross inadequacies of that market facility which doubtless have a parallel in many other stockyards. A recent sample survey in designing for the San Antonio stockyards, in which I participated, revealed that a relatively expensive mailed market report was not nearly as useful as the managers had thought from a previous technically inadequate survey of their own. As a consequence it is being discontinued. I mention these simply because they are most familiar to me and because they are possibly somewhat representative. They illustrate that the task is a large one. A visit to the Chicago stockyards impresses one with the diseconomies of the layout.

As economists we can contribute much more to marketing progress if we will get off the sidelines and into the game. It is not just a matter of choice, as I envision it. Beef and pork face increasing competition from broilers as a result of efficiencies developed by the broiler industry in processing and marketing, as well as in production. The 85 per cent increase in per capita consumption of chicken since 1935-39 came from a new broiler industry having a watchword of production and marketing efficiency. New methods of marketing such as the new Swift and Armour lines of frozen, prepackaged, boneless and trimmed meats may eventually help point the way to some of the needed answers to eventual greater economies in marketing of food products.

As a final comment, I should like to urge fellow economists in the marketing field both (1) to familiarize themselves with and (2) to use to the utmost those techniques developed by commercial marketing firms. I would also include the techniques from those disciplines in the schools of business administration that pertain to marketing, advertising, psychology of consumers and related fields.

DISCUSSION: THE ECONOMIC IMPACT OF TECHNOLOGY ON FARM COMMODITIES: THE CASE OF ORANGES

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I have enjoyed reading Mr. O'Regan's paper. We all agree with him, I believe, that frozen orange concentrate represents the principal change in technology in the orange industry.

He has outlined his paper in four parts: consumers, growers, regions, and organization. This pretty well covers the subject, I think, and I will follow his outline in my remarks.

Consumers

O'Regan has shown that for the 1944 crop year about three-fourths of the oranges were consumed fresh; for 1953, only 43 per cent of the crop was consumed fresh and only slightly less was consumed as frozen concentrate.

If we examine this shift to frozen concentrate on a per capita basis, it is even more impressive. As late as 1947 only one-half pound of single-strength equivalent of frozen concentrate was consumed per capita. By 1953 this figure had risen to thirteen pounds.

For this seven-year period the rise in consumption of all single-strength equivalent of orange juice was nine pounds per capita. Thus, frozen concentrate in part was displacing single-strength orange juice. Moreover, per capita consumption of fresh oranges for this seven-year period dropped from 44 pounds to about 27 pounds.

From 1947 to 1953 United States production of oranges increased from 113 million to 136 million boxes; so there was an actual increase in per capita consumption of the product over all.

O'Regan has shown that the retail price of frozen concentrate declined about 35 percent during the period 1950 to 1956. Hence, it would appear that consumers have benefited from this technological change.

Growers

Mr. O'Regan mentions that the changes in technology have not resulted

in stabilizing growers' prices, and he shows that net returns to Florida growers have fluctuated sharply.

We have seen that orange production increased rather steadily during the past decade. However, during this period the farm value of the orange crop declined from a high of 303 million dollars in 1945 to 179 million in 1946 and to a low of 147 million the following year. The trend in farm value was upward thereafter reaching nearly 255 million dollars for the 1953 crop.

With production rising rather steadily, it is evident that variation in price to growers, from season to season, largely accounts for fluctuations in crop value. For the successive crop years 1945 to 1951, with one exception, there was a marked inverse relation between size of crop and price to growers. However, from 1951 to 1953 there was an increase both in size of crop and in price to growers evidencing an increase in demand. Moreover, the same was true for the period 1946 to 1953.

Regions

The period that has seen the phenomenal rise in the frozen concentrate industry has seen Florida move well ahead of California as an orange producing state. Florida first produced more oranges than California for the 1945 crop. Hence, we see that the change in rank of these two states as orange producers occurred at a time when the frozen concentrate pack was less than one per cent of what it is now. An examination of the statistics on frozen concentrate production, however, bears out O'Regan's statement that, "The Florida citrus industry seems to have a natural advantage in the production of orange concentrate not enjoyed by the principal rival industry in California." For the period 1947 to 1953 the production of Florida frozen concentrate increased from about two million gallons to about 65 million gallons. California production increased from about one-half million gallons to about five million gallons in 1952 and then fell off to about one and one-half million gallons in 1953.

O'Regan has sought an explanation of this situation. Points that he makes in explaining it are: (1) The expansion of Florida production combined with the shift in time of marketing, as a result of frozen concentrate, has undoubtedly played a part in the decline of California as an orange producer. (2) The impact of concentrate upon the California growers is confounded with the effects of real estate prices and growing cultural costs. It seems to me that this second point is a more fundamental one than the point that an increase in Florida concentrate has played a part in the decline of California orange production. Extensive urbanization in the orange-growing area of California has taken its toll of acreage. I am still not well satisfied, however, with O'Regan's explanation of these carrying regional effects.

Why did California production of concentrate not keep pace or lead that of Florida? After all, California was producing more oranges than Florida as late as 1944. A point that should be mentioned, I believe, is that a sizable part of the California production was Navels. Navels, I believe, lend themselves especially to use as fresh fruit. Also, California Valencias commanded a higher price than Florida oranges; hence, the Florida processor had access to a cheaper source of supply than did the California processor.

It is interesting that the pioneer firm in producing frozen concentrate, Vacuum Foods Corporation, was located in Florida. The processing of frozen concentrate started in Florida. Perhaps the factor of a head start over California has been significant in the greater gain made by Florida in the production of frozen concentrate.

Organization

O'Regan has indicated that there has been a tremendous growth in the capital requirements of the Florida concentrating industry. He speaks of the uncertainty these firms face in the price they must pay for fruit and in the price they will be able to ask for their finished product, of the pressure of demand upon supply, and of the sometimes disastrous effects of price changes. Although there are risks to firms as a consequence of price fluctuations, surely price changes could be profitable as well as disastrous. As for demand pressing on supply, I should think that very healthful for an industry. With the large firms that he reports, probably being few in number, I am wondering if there is not an element of monopoly in their buying. Whereas marketing charges for processed fruits and vegetables declined about four percent between 1947 and 1955, prices to farmers declined about sixteen percent. This would indicate that the processors were better able to protect themselves than were the farmers.

Summary

O'Regan mentioned in closing that it might have been interesting, if time and title had permitted, to explore the effect of the introduction of frozen concentrated orange juice upon the market for fresh grapefruit. I should like to have seen such an analysis.

A look at the farm value of oranges and grapefruit is revealing. For 1945 the value was 391 million dollars, an all-time high. The next year the figure was 227 million dollars. In 1948 a high of 444 million dollars was reached. For 1954 the farm value of these two crops was 264 million, back toward the 1946 level.

The farm value of these citrus fruits has not kept pace with disposable personal income. When farm value was 227 million in 1946, disposable

personal income was 159 billion dollars, but with a farm value of 264 million in 1954, disposable personal income had risen almost 100 billion; the figure was 254 billion dollars. Thus, we have further evidence that the benefits of technology are being passed along to consumers.

DISCUSSION: THE ECONOMIC IMPACT OF TECHNOLOGY ON STRAWBERRIES

ROBERT C. ROCK
Extension Service, University of California

Mr. McDowell has presented us with a most informative analysis of the impact of technology on the production and marketing of strawberries. Few agricultural industries can claim the technological progress that has shaped the course of the industry during the postwar years. The development of new and better varieties and the growing efficiency in methods of production, preservation and distribution have resulted in a fast-changing and expanding industry. Here in California where the strawberry industry has made spectacular growth with state acreage climbing for the last ten successive years, we have been able to observe at first hand what technological progress can mean to an industry.

Although McDowell paints a very clear and detailed picture of the many technological changes and innovations that have occurred in the industry, his analysis in terms of the economics of technological development is more limited in scope. For all of us, whether we be researchers, teachers, farmers or businessmen, there are lessons to be learned from the history of technological progress. McDowell strikes a basic truth of the economics of technology when he says, "Technological progress in one field or in one direction often requires and must wait upon progress in other fields or directions in order to contribute its maximum benefit. Heavy production in itself may have an adverse effect on price, more than off-setting lower unit cost of production." The importance of correct timing is evident in the introduction of all technological change. We have many examples of this phenomenon—the classic example being that of refrigeration facilities. The spectacular growth of the frozen-food industry in recent years has been possible, not only because of the perfection of quick-freezing techniques and equipment, but also because of adequate cold-storage warehousing, transportation and frozen-food cabinets in retail stores.

In a recent report,[1] Dr. R. G. Bressler, Giannini Foundation of Agri-

[1] "Statement for Subcommittee of Agricultural Advisory Council," *Agricultural Surpluses and Output Increasing Technology*, 1956.

cultural Economics, University of California, discussed the economics of technological development and innovations and made this illuminating statement. "When innovations—of any type—are first introduced, they result in increased profits for the original innovators. Unless checked by some legal institution, such as a patent, increased profits draw new resources into the industry, output is increased, prices are forced down, and eventually profits are reduced to a normal level. The ultimate effect of innovation then, is not continued levels of increased profits for the industry but, rather, an increase in the total aggregate of goods and services available for all of society. In agriculture, the combination of relatively inelastic demands plus an industry that is relatively slow to adjust *in the aggregate* may well result in long periods of depressed incomes before resources are forced out of agriculture and/or demands expand sufficiently to return the industry to a normal income situation."

It is within the framework of these economic principles of technological development that the strawberry industry should be analyzed and its future course appraised. Although questions regarding the future economic course of the strawberry industry cannot be answered with certainty, major problems should be identified and discussed. The answers to the important questions of desirable production levels, the nature and level of demand, and the allocation of the strawberry crop between the fresh and frozen outlet in order to maximize industry returns are closely associated with future technological developments.

Turning to the discussion of the current supply and demand situation, I am in general agreement with the analysis and forecast. Last year production caught up to and slightly exceeded disappearance estimates but not sufficiently to weaken the market. This year the industry is well on its way to establishing a new record frozen pack, and grower prices have weakened. I also feel that consumption of strawberries can be raised above that of recent years due to the availability of the high quality frozen product and trade promotion carried on by the industry. I believe, however, that the comparison of per capita consumption estimates between the 1920's and today is apt to be misleading. The figures indicate that the per capita consumption of fresh strawberries was 4.1 pounds during the 1920's and the combined per capita consumption of fresh and frozen strawberries currently is estimated to be 2.5 pounds—the inference being that we are now consuming fewer strawberries per capita than during the 1920's. This might not be true since per capita consumption is calculated from total disappearance estimates and not actual consumption, and we have every reason to believe that the losses occuring during the marketing process are much less today than during the 1920's. This is due to improved refrigeration and to more efficient handling. Another

situation that limits the use of per capita consumption figures in such comparison is the difficulty of accurately measuring the quantities of frozen strawberries shipped into the United States from Mexico and the shipments of strawberries between the United States and Canada. In combining the per capita consumption figures of frozen berries and fresh, we must also take into account the fact that frozen figures are on a processed weight and include an additional weight of sugar added.

In closing I would like to acknowledge the important contributions the Federal-State Market News Service has made over the the years in collecting and reporting agricultural economic information. All too often we take for granted this essential task. In these days of rapid technological progress, we are vitally in need of information typified by Mr. McDowell's excellent presentation.

REPORTS AND MINUTES

ANNUAL REPORT OF THE PRESIDENT, AFEA

In reporting to you on the affairs of our Association, my thoughts turn first to the sadness that struck us upon the death of fellow members. We mourn the untimely loss of Major John William Firor, and of Dr. Lawrence Joseph Norton, who was one of our former presidents and secretary-treasurers. I suggest that you rise for a moment of silent meditation in homage to the memory of our late friends.

When Joe Ackerman handed the presidency to me, I realized that our Association is a strong and going concern, with extraordinary vitality. He and his team of officers left it in excellent shape. Since then, he has given me effective aid for which I thank him and the Farm Foundation. Owing to splendid teamwork and cooperation from many sides, we have more than held our own, and have made some further progress.

In accordance with the members' expressed desire, the New York Winter Meeting last December was built up to a full-fledged professional meeting, and to the cultivation of relations with other professional social-science associations. We had an afternoon session, a luncheon, and a particularly well-attended dinner session, together with a large number of joint sessions with several allied societies meeting concurrently. Credit for the success of the Winter Meeting goes largely to Frank Atchley and W. M. Curtiss, who made all the difficult local arrangements and maintained liaison with the joint committees of all the other societies in session.

Under its chairman, Norman Nybroten, the Employment Committee has made arrangements here at Asilomar to enable our members who wish to explore employment opportunities or to fill vacancies on their staffs to meet privately at mutual convenience. He is making job specifications of vacancies and curricula vitae available at the meeting, and will issue a list of vacancies and positions desired available to all members at a later date. It seems good policy to acknowledge the important aspect of a "market" for talent, skills, and experience which our meetings have.

A hearteningly successful venture was our membership drive, designed by Howard Diesslin and executed by him, Harry Trelogan, and Russell Ives, together with scores of individuals who helped with such efficiency that we won 546 new subscribers to the *Journal of Farm Economics*. This boosted the total number of subscribers to the *Journal* to 3,100 (2,244 individual members including 284 students and 760 institutional subscribers including 425 foreign libraries and firms). This masterpiece of organized canvassing was supported by another project—the first "Who's Who" type of biographical directory of our individual members as of June 30, 1956. The preliminary work on this much-needed handbook was done by a committee under the leadership of Roscoe Saville. The editorial work on the 1,678 biographies turned in to this committee still remains to be done. The Executive Committee has just allocated $8,000 to complete this project, if possible by the end of the calendar year, and is confident of recovering most, if not all, of this input. The Committee had decided by mail ballot of April 7, 1956, that the directory will be supplied free of charge exclusively to individual members in good standing on or before

June 30, 1956 who qualify for listing in it; that all individual members after that deadline shall be entitled to one copy each at $2.00, and that all institutional subscribers may purchase one copy at $3.00. I recommend that beyond this allocation further copies should be sold at a price of $5.00 each. There will not be a new edition of this directory before 1959.

The success of our membership campaign strongly suggests that one of our elected officers, preferably one of the vice presidents, be charged with the specific task of conducting such a campaign every year, particularly among graduate students.

The Awards Program was not only carried forward in its traditional work, but its scope broadened this year, and its organization strengthened. William Nicholls served as chairman of the whole Awards Committee, guiding the work of four subcommittees implementing the Awards Program. Harold Halcrow was chairman of Subcommittee I (best *Journal* article); Jim Cavin headed Subcommittee II (Published Research Reports); and Harold Rowe was chairman of Subcommittee III (Ph.D. Theses). Robert Kramer, chairman of the Student Section Committee, was also chairman of Subcommittee IV (Student Activities). The work of Subcommittees I, II, and III was executed by their chairman and 23 judges. A total of $1,550 was allocated for seven awards, and five awards of Honorable Mention were made. Grateful acknowledgement goes to those who had a part in carrying forward the Awards Program and discharging its exacting responsibilities with such care.

Great efforts have been made to strengthen students members' participation in the Annual Meeting. Although it proved impossible to obtain travel funds for students from outside sources, the Executive Committee established a new contest for papers contributed at the Annual Meeting by graduate students. This program carried four awards, each consisting of round-trip bus fare to the Annual Meeting, $20 subsistence, and 100 free *Journal* reprints of the paper presented. The contest was operated by Subcommittee IV, under Robert Kramer; the three members of his subcommittee served as judges for the 12 entries submitted. Prizes were also made available for the students' section debates and speaking contests, with the arrangements being made by William O. Jones.

Under the able management of Harold Halcrow, Editor, and George Brinegar, Associate Editor, the *Journal of Farm Economics* is more than ever the Association's most vital and influential activity. Its May issue has been expanded to the scope of another proceedings issue for the papers of the Winter Meeting. The Editor has also added a valuable service to our profession with a report on all master of arts and doctoral degrees conferred in agricultural economics, and on all students working toward those degrees in the United States. But, admirable as the *Journal's* achievements have been, it is locked in a neck-and-neck race with the printer's bill. This situation leads me to a few remarks on our budgetary problems and policies.

In spite of the unpaid time for editorial work and facilities, in 1955/56 the *Journal* involved a cash outlay of about $20,600. This includes total expenses for printing reprints. At 2,600 subscribers, this amounts to about $8.00 per subscriber. Our full subscription rate is $7.00 for individuals and institutions, and $3.00 for students. Our *Journal* costs are rising. If we want to combat these rising costs successfully, we should clarify the status of subscribers to the

Journal who are not members, and the status of members. Our constitution sensibly makes this distinction by bestowing voting rights only upon individuals. It is implicit that we are a society of natural, not legal, persons. I am firmly convinced that we should establish a *Journal* institutional subscription rate that is higher than the fee for individual members. There is no valid reason why we should subsidize 335 domestic corporations and libraries and 425 foreign libraries, firms, and governments at the expense of our individual members.

Despite the large rise in regular $7.00 memberships, which now stand at 1,960, we have neither been able to avoid a deficit nor to maintain our capital stock. I believe we would do well to increase our revenues, without charge to individual members, by:

a) increasing institutional subscription rates by 50 percent; and
b) expanding paid advertising revenues in the *Journal* by $5,000 per year.

I also believe we should once more explore the possibility of shifting to a production process of equal or better quality yet substantially less expensive than printing. In any case, we must renegotiate our contract with the printer. When we issue our Directory, we should make it self-supporting by recovering expenses through advertising revenues primarily from book and journal publishers, and by selling copies at the prices fixed by the Executive Committee.

We should try to strengthen the Association's financial position with the object of eventually becoming independent of heavy subsidization by the institutions carrying the offices of secretary-treasurer, editor, and president–in that order. I have often heard critical remarks about the accumulation of a capital stock in our treasury, which accrued chiefly through Asher Hobson's insistence and tenacity. But I have also been impressed by the fact that almost every one of our presidents has rediscovered the dire necessity of such a policy. Without it, we would be perpetually insolvent, and more than ever dependent on the crutches of subsidies from institutions. In view of the long-run course of gradual but perpetual inflation in the democracies of our time–whether "conservatives" or "progressives" are in power—we are continually in the cost-price squeeze ourselves, and must adjust by keeping revenues abreast of rising costs. We ought to fortify our capital stock with insistence and with the conviction of its necessity.

When in Larry Norton we lost one of the three members of the Investment Committee, I enlarged the committee membership and expanded its assignment. The new Committee on Finance is charged with the responsibility of guiding investment policy and of advising the Executive Committee on the business aspects of the Association, including particularly *Journal* advertising. Under the chairmanship of Reynolds I. Nowell, and members E. T. Baughman, E. C. Bennion, H. W. Anway, P. E. Anderson, and Lowell Hardin, the committee has carefully reviewed our investment portfolio, finds it praiseworthy and has given much thought to revenues from advertising and other sources. Since it is asking too much of the Editor to take on the task of exploring the advertising market and retailing advertising space in addition to his great and time-consuming editorial responsibilities, this assignment was delegated, with Mr. Halcrow's approval, to the Committee on Finance.

The report of the Committee on Finance points to a most promising solution of our major financial problems without raising dues for individual members in

the near future. I want to express special appreciation to Reynolds Nowell and his committee for their conscientious work, and recommend that this committee be continued with the assignment of obtaining a maximum number of sustaining memberships.

Much remains to be done in adapting our business administration to the Association's growing stature and increasing activity. We must streamline it and by setting up certain rules make it more consistent. The formula that "tradition" should be the only guide, and that the President should be free to use his powers and imagination may be plausible, but it alone is not workable. The Executive Committee, by adopting its own rules of administration, would provide particularly for a more systematic delegation of power and decentralization of jobs as the Association continues to grow. This course would also serve to distribute the burden of subsidizing operations until the Association can pay all of them.

Certain problems of professional arrangements are also a legitimate concern of our Association. I recommend to my successor that a committee be appointed to explore the idea voiced by H. G. Hamilton—that doctoral candidates be temporarily employed by other institutions on research projects, with the proviso that they return to their home institutions to use their research-project data for completing their dissertations. This arrangement could be valuable from many angles, and give effective professional and financial aid to many of our most promising young colleagues.

The Association should continue its efforts to guide the profession by research. It should, in particular, publish a well-balanced, solid guidebook on higher mathematics and statistical analysis. And it ought to consider the multitude of problems of public-policy adjustment arising from the rapid shrinkage of the human resources employed in the farm sector of our economy. The books published in the past by our Association have not only been successful ventures intellectually, but have even augmented our revenues.

Our Annual Meeting has long been a pleasant, multiple-purpose occasion, uniquely our own. This year it is more so than ever, joining WFEA and AFEA members, and the Giannini Foundation of the University of California and the Food Research Institute of Stanford University as the host institutions. President Calhoun and I were met by the most spontaneous and unselfish collaboration among the staffs of these institutions in rolling out the red carpet for our friends from the 48 states of the Union and from Canada. From working together thus, we at the Food Research Institute have enjoyed a windfall in much closer personal relations with our friends across the Bay than we have known for many years. For this my thanks go to Ray Bressler and his colleagues.

The program is governed by the determined effort to counteract the imminent danger of disintegration owing to overemphasis upon and exclusive allocation of time to the reading of papers on specialized subjects in section meetings. General sessions have been dedicated to the broadest world-wide and national economic problems, as well as to the political issues of economic policies in a democracy, with sufficient time allotted to open discussion from the floor. To the usual program pattern has been added the experimental feature of four panel discussions with moderators and teams of rapporteurs, and a section meeting devoted to carefully selected graduate-student papers. At the same time, special subjects have received their due attention by 14 section meetings. The

organization of six of them was delegated to particularly qualified individuals. For this thanks are due C. B. Baker, Owen Brough, Rex Rehnberg, Harry Trelogan, and Fred Waugh.

Many problems were posed by the fact that the site of the Annual Meeting was some distance from the headquarters of the host institutions. The team of Roger Gray, Jim Boles, Dave Clarke, and John Hopkin conquered even the toughest of these in nine months of hard, painstaking, and often tedious work.

A conducted tour was arranged, this time not only to give our friends east of the Rockies some insight into the unique features of California agriculture, but to meet with those who make it what it is—California's farmers. The staff work and the difficult reconnaissance work on each farm was headed first by George Alcorn, later in the main by A. D. Reed and a diligent and devoted committee.

But our Annual Meeting could be nowhere near the human-relations and recreational family affair that it is were it not for the work of the Ladies' Hospitality Committee. With imagination, efficiency, and grace, over many months of negotiation, this committee formulated and executed its plans under the brilliant leadership of Mrs. Holbrook Working. Cooperation with this committee has been the charming embellishment of my job. If many novel ventures did not founder for lack of precedent, it was because the ladies supported them enthusiastically and effectively. This applies particularly to the concert of chamber music we had on Sunday evening.

I want to draw your attention to the significant fact that 1959 will be the 50th year in the life of our Association, and that due preparation should be made for an appropriate semi-centennial celebration at our Annual Meeting.

The year in which I have had the honor and privilege of serving you as President has been richly rewarding, and the unique experience of a lifetime for me, particularly owing to the wonderful zest with which I have been accorded spirited cooperation from all sides. If the ship is in good trim and is sailing well, the credit belongs to all those who have so cheeringly manned it for the past 12 months.

KARL BRANDT, *President, AFEA*

REPORT OF THE LOCAL ARRANGEMENTS COMMITTEE FOR THE 1955 WINTER MEETING OF AFEA, NEW YORK, DECEMBER 28-30, 1955

The Local Arrangements Committee was formed in late June 1955 when the president appointed W. M. Curtiss of the Foundation for Economic Education as chairman, and Curtiss asked Frank M. Atchley, Agricultural Consultant of the Grocery Manufacturers of America, 205 East 42nd Street, New York, and Charles J. Blanford, Milk Market Administrator at the same address, to serve on the committee. Most of the Committee's activity was in New York City, and Atchley proved very helpful because of his location. Curtiss was 30 miles away and it was more difficult for him to attend committee meetings. The committee worked in conjunction with the chairman of the Joint Arrangements Committee for the economic and allied Social Science Associations (George

Garvy), and with the Printed Program Committee of which Henry Steinhaus was chairman.

The AFEA Local Arrangements Committee assisted in the following tasks:

1. Attending monthly joint committee meetings on policy matters.
2. Arranging for a December 1 mailing of information to AFEA members and a survey of attendance.
3. Arranging one luncheon meeting and one dinner meeting for AFEA members.
4. Assisting in securing additional secretarial and clerical help at the Winter Meeting.
5. Preparing a special printed program for the AFEA meeting.
6. Rendering whatever services seemed desirable while the Winter Meeting was in progress.

There was very little required of the committee in its meetings with Joint Committee members; Garvy's committee was handled with an efficient delegation of responsibilities to its members. The December 1 mailing consisted of: (a) a letter from Karl Brandt; (b) a letter from the Local Arrangements Committee; (c) a memo listing additional hotel information; (d) a special printed program of AFEA and joint meetings; (e) a business reply card for return to W. M. Curtiss giving particularly information as to attendance of the luncheon and dinner meetings.

The printed program was supplied by Harold Halcrow, Editor of the *Journal of Farm Economics* through the George Banta Company, Inc., Menasha, Wisconsin. The cost was borne by the AFEA. Approximately 1,800 mailings were made in #10 envelopes with addresses supplied on gummed labels by Lowell Hardin, Secretary-Treasurer of the AFEA. Only U. S. and Canadian individuals were included in this mailing.

A total of 65 cards were returned, 46 saying they would attend the luncheon and 54 the dinner. Actually, the luncheon count was 53, and the dinner count 77.

The cost of this mailing included the cost of the printed program (not here), multilithing three sheets of letters and information, reply card, first-class postage (6 cents), and labor. The total, not including the printed program, was about $200, or about $3.00 for each reply received.

Mr. Atchley did most of the work arranging for the luncheon and dinner—getting tickets printed, selecting dining rooms, deciding on charges, menus, and other technical matters.

Heads of Departments of Agricultural Economics in Connecticut, New York, New Jersey, and the Equitable Life Assurance Society were all invited to contribute secretarial or clerical help during the meetings, and did so. The impression of the Chairman was that this was not essential.

The total bill submitted by the Local Arrangements Committee to Secretary-Treasurer Hardin was $233.77. In addition to $200 for the mailing to 1,800 members as mentioned above, the balance was postage, phone calls, and rail travel.

It was the chairman's understanding that the Joint Committee would have a balance to divide among the associations on the basis of registrations at the meetings. This balance was to result from profit from advertising in the Joint Program and from the remainder above costs from the registration fees. The chairman further understood that he would be informed of this decision, but

never was. He thought it was to be around $60; against this was to be charged the shortage of about $25 on the luncheon and dinner.

FRANK M. ATCHLEY
CHARLES J. BLANFORD
W. M. CURTISS, *Chairman*

REPORT OF THE AFEA-WFEA LOCAL ARRANGEMENTS COMMITTEE, 1956 ANNUAL MEETING

The Local Arrangements Committee for the 1956 joint meeting of the American Farm Economic Association and Western Farm Economics Association consisted of James N. Boles (Giannini Foundation) and Roger W. Gray (Food Research Institute), a co-chairmen, and David Clarke (Giannini Foundation) and John Hopkin (Bank of America). Because the distance from the Bay area to the conference grounds precluded the possibility of a large numer of staff members familiarizing themselves with the conference setting, it was immediately determined that this should be a working committee instead of a committee to coordinate the efforts of other committees. The allocation of major responsibilities among the members was as follows:

Financial accounting	Boles
Meeting facilities	Boles
Correspondence and coordination with other committees	Boles and Gray
Membership mailing	Gray
Registration and Housing	Gray
Transportation—Clarke	
Press and public relations—Hopkin	

The Committee began its planning in December 1955, and had the preliminary planning completed by April 1956.

As matters developed, each of the members bore a major responsibility under the above allocation—a responsibility which in other circumstances would have been borne by a separate committee chairman with a full committee at his disposal.

The necessity of registering all persons attending the meetings and of assigning accommodations to them posed a major problem of coordination with the Asilomar management and of careful financial accounting. The location of the meeting grounds in relation to public transportation terminals posed another major problem of transportation. The press and public relations function is an important one in any circumstances, but its importance was seemingly enhanced by the attention being concurrently focussed on farm economic problems.

The advance mailing to all AFEA and WFEA members in the United States and Canada went out in April. By mid-June it was apparent that attendance would be good, and by mid-July it was becoming evident that the housing facilities at Asilomar would be overtaxed, so the touchy task of reserving additional space at nearby motels was undertaken. In the final analysis, we had to assign approximately 200 persons off-grounds, in addition to those who had elected to make their own reservations. Total attendance we estimate at 875,

although we did not ascertain the family composition of some of the people who stayed off-grounds. The cooperation and forbearance of the membership made ours a pleasant and gratifying task. Both the Food Research Institute and the Giannini Foundation gave generously from their facilities, and particularly from the time of their staffs and graduate students.

The major expenditures and sources of funds, in approximate figures, is as follows:

Expenditures:	
Printing and mailing of preliminary program and other materials	$ 700.00
Printing of final program	860.00
Hired entertainment and recreation supervisors	335.00
Transportation for tours	200.00
Expenses for graduate student workers	75.00
Loss on motel reservations	20.00
Miscellaneous charges by Asilomar including lifeguards, piano tuning, punch, tea, cakes, etc.	185.00
Miscellaneous expenditures including supplies, equipment rentals, telephone, telegraph, and postal expenses, and Hostess Committee expenditures	360.00
	$2,735.00
Sources:	
Advertising in program	900.00
Registration fees	950.00
Contribution of WFEA	200.00
Contribution of AFEA	960.00
	$3,010.00

(The indicated excess of $275.00 over expenses may somewhat exceed the amount to be returned to AFEA by the time remaining small items are picked up.)

Food Research Institute and Giannini Foundation undertook additional out-of-pocket expenses not listed above.

Asilomar provided free publicity materials, as did the California Automobile Association, and the Monterey Chamber of Commerce. The California Wine Institute donated wine.

The Field Trip was operated on a self-sustaining basis.

JAMES N. BOLES
ROGER W. GRAY

REPORT OF THE LADIES' HOSPITALITY COMMITTEE, 1956 AFEA-WFEA MEETINGS

Planning the social side of the conference held at Asilomar in August was an assignment undertaken with great enthusiasm by the Committee. Asilomar is a favorite with those who know and love the Monterey-Carmel coast, with its accessibility to Monterey's old Spanish buildings; Carmel, the once secluded artist colony turned vacation spot; the remote and slightly forbidding mountains, often shrouded in fog; beautiful white beaches; wind-blown pines and cypresses; great estates and hospitable homes with beautiful gardens. All these were avail-

able. Time and the need to choose carefully, in order that each guest might be free occasionally to explore alone, were the limiting factors.

The entertainment planned for men as well as women attempted to make available some of the natural beauty and local talent. Since Carmel has many musicians, a concert by string orchestra was arranged by President Brandt preceding an informal reception on Sunday evening, with the presidents of both associations and their wives as hosts. The associations received from the California Wine Institute an assortment of California sherries which were sampled by those interested at a party Tuesday afternoon in one of the outdoor patios. The last evening, tables were arranged under the pines for a barbecue dinner, with Mexican singers in costume to amuse the guests with their songs and guitars.

For women guests, information was provided for planning individual trips and entertainment, and organized entertainment was arranged for mornings and afternoons of two days. These included a tea, chartered bus tours to the Carmel Mission and historic spots in Monterey, and tours by private cars to scenic areas, a ranch, homes, and gardens representative of California living.

Entertainment for the teen-age group and children of 5 to 12 years was planned separately. For the teen-age group, the young daughter of one of the Committee acted as Chairman, arranging special tables at the opening dinner, followed by an evening party. Thereafter the teen-agers planned their own amusements or occasionally joined the adults.

The Monterey Recreation Department cooperated in supplying playground and craft supervision for children in the 5-to-12-year group, with one person for approximately each ten children. A lifeguard was scheduled for the swimming pool used by adults as well as children.

The Chairman of the children's program suggests consideration of the following points, if future conferences offer such a program.

1. Information about the time and place of children's activities should be available at the time of general registration.

2. The program sessions should run at least 15 minutes before and after the period of mothers' activities to allow time to leave the children and return.

3. A supervised program for children of 2 to 5 years would have been welcomed by some parents and possibly could be arranged with parent participation.

4. A list of baby sitters was provided which went unused until the last day, and then was in demand.

5. In general, children should not go on organized tours, and definitely not without a parent.

To arrange the entertainment program, a Committee of six was appointed in October. Soon after, the Committee made the first of many trips to Asilomar to review the site and to interview agencies such as the Monterey Recreation Department and the Monterey Chamber of Commerce, both of which proved invaluable in providing information, contacts, and assistance. By spring, the committee was enlarged to include the wives of all the host institutions' staff members, and a program outline was prepared, complete with subchairman, hostesses and lists of equipment needed to put it into operation. Each hostess received a list of her duties, which in the beginning were divided about

equally. After the conference opened, one of the positions of greatest responsibility was that held by the chairman in charge of the women's registration table, with its posters announcing activities. She and those working with her provided information and listed people for activities and tours in folders provided for each event. She also started busses and caravans of cars, checked names when necessary, and saw that cars were filled and that routes were clearly understood.

MRS. KARL BRANDT
MRS. R. G. BRESSLER, JR.
MRS. R. W. GRAY
MRS. B. F. JOHNSTON
MRS. V. D. WICKIZER
MRS. WENDELL CALHOUN, *Vice Chairman*
MRS. HOLBROOK WORKING, *Chairman*

ANNUAL MEETING WESTERN FARM ECONOMICS ASSOCIATION

Meeting of the Council, August 26

President Wendell Calhoun presided. A tentative Awards Program by the Association was discussed. This had been developed before these meetings by members of the Executive Committee and others of the Association. The purpose of this program would be two-fold; to stimulate and promote professional competence, and to strengthen and broaden the activities of the Association. Statements and procedures for five such awards had been prepared and circulated to the state councilmen prior to the meeting. These had been discussed by them with other members, and rated according to order of preference. Such proposed awards, in order of majority preference as expressed by the councilmen, were as follows:

For *Research* in Economic Problems of the Agriculture of the Western United States
To *Graduate Students* in Agricultural Economics
To *Undergraduate Students* in Agricultural Economics
For *Extension Agricultural Economics Achievement*
To *Agricultural Economics Clubs*

Recommendations were considered of the cash amounts to be offered by the Association for each award. It was agreed that *recognition* for good work accomplished would be of greater incentive to the individuals than such modest monetary awards as the Association might make. The award is primarily one of honor, with a little money to make the honor more pleasant.

A major benefit to the Association should be to interest more students in membership, with the expectation that the majority of them will remain in the Association after graduation.

Motion was passed: That the Council recommend to the Association the following four awards, to be set up on an experimental or trial basis for one year: Research, Extension Achievement, Graduate Students, and Undergraduate Students.

Discussion followed of the amounts of such awards to be offered by the Association. Suggestion was made that at least part of each award be for expenses to the annual meeting of the Association.

Motion was passed: That the Council recommends awards for 1956-57 in the amounts of: $100 for Research, $100 for Extension Achievement, $50 for Graduate Students, and $50 for Undergraduate Students, a total of $300, and that further action be considered at the next annual meeting, on the basis of the response during this year.

Motion was passed: That the President appoint an over-all Awards Committee, with subcommittees for the respective awards, and that the Vice President of the Association be Chairman of this Awards Committee.

It was agreed that the Awards Committee will have the responsibility to develop regionwide publicity for this Awards Program.

Annual Meeting of the Association, August 27

Vice President Seltzer reviewed the proposed Awards Program, and presented the recommendations of the WFEA Council.

Question: "Would these awards be limited to members of the Association?"

"Not necessarily. Any professional worker or student in the Western Region."

By motion passed, the award to Graduate Students was amended to include a thesis, and to read: "Subject: A paper or thesis which stems from research underway by the student."

Motion was passed: That this program of four awards, for Research, Extension Achievement, Graduate Students, and Undergraduate Students, be adopted for the coming year (1956-57); and that the President be instructed to appoint an Awards Committee.

Harrington reviewed the preparation of the 1955 Proceedings, and reported that response had been most favorable to their style and arrangement. Much of the inspiration for this came from the Regional Writing Short Courses that have been sponsored by the Western Agricultural Economics Research Council. He also discussed the duties of the Vice President. Normally these consist almost entirely of editing the Proceedings and getting them published after each annual conference. Therefore, it would seem to be more suitable to designate the office as "Editor and Vice President."

Motion was passed: That the Constitution of the Association be amended to read as follows, under Article III, Officers, first sentence: "There shall be a President, a President-Elect, an Editor and Vice President, a Past President, and a Secretary-Treasurer." The third paragraph of this Article shall also be amended by the substitution of "Editor and Vice President" for Vice President.

Question: Would this change the order of succession, if the Presidency of the Association should become vacant?

After discussion it was agreed by consensus that this would not change the order of succession. The Editor and Vice President serves as Vice President during the year of his election, even though his editorial duties follow the next annual meeting. Thus, the candidate elected as Editor and Vice President in the election conducted in August of 1957 will serve as Vice President during the 1957-58 term.

President Calhoun reviewed a proposal that had been submitted to the Executive Committee and the Councilmen on July 19, 1956, that instead of an annual proceedings, the Association start the issuance of an annual journal. This publication would consist of selected papers on agricultural economics, including papers presented at the annual conference, prize-winning papers from the Awards Program of the Association, and perhaps others which might be submitted. Such a journal would be entered as second-class matter with the Post Office Department.

William Jones offered as an alternative a proposal that the Western Farm Economics Association and the Western Economic Association jointly publish a semi-annual journal. He explained that the Western Economic Association is quite similar to the Western Farm Economics Association in type of activities, in objectives, and in size, with its members drawn largely from the economics and business departments of colleges and universities in the 11 Western states. Total membership is about 350-375. It meets about the same time of year as WFEA, and for the same length of time. A considerable number of the members are also members of WFEA, and suggestions have been made of occasional joint or overlapping meetings by the two associations. This had been discussed for 1956, but of course was dropped after the joint WFEA-AFEA conference developed.

WEA issues an annual Proceedings, and has considered the establishment of a semi-annual journal. One issue of this journal would be the proceedings of the annual conference, and the other would be made up of contributed articles. Consideration also has been given to join in publishing operations with some other association. The WEA Proceedings have been printed at the University of Utah, where good arrangements are available.

Discussion followed of various possibilities for joint publications between the two associations.

Motion was passed: That the President appoint a committee to explore with representatives of the Western Economic Association the possibilities of a joint program of publications; and if this seems feasible, to develop a plan for such publications and circulate it to the membership for study and consideration.

Motion was passed: That in view of possible difficulties of developing satisfactory arrangements for publication of a journal jointly with the Western Economic Association, the committee appointed to explore these arrangements also should explore the possibility (1) of discontinuing the present annual proceedings, and (2) substituting for it an annual journal which would include the major papers from the annual meetings, the award-winning papers from the research, graduate and undergraduate contests; and the minutes of the annual meeting.

Roger Gray was asked about the total attendance at the Asilomar conference. He replied that 429 persons were staying on the Asilomar grounds, but no record was available of the total number of individuals attending but staying off the grounds. The best estimate available of the total number of individuals in attendance was 850 to 875.

Motion approved by acclamation: That the Association express our appreciation to Roger Gray and Jim Boles, the Co-Chairmen of the Arrangements Committee, for their splendid services; to the several other committees that have contributed so greatly to the success and enjoyment of this meeting; and to the management of Asilomar for their hospitality.

Best wishes of the Association, and a standing ovation, were extended to H. R. Wellman, who was President in 1949 when the first joint conference with AFEA was held. He commented: "The Association has made a great deal of progress since I was President."

The following nominations by the Council for Association officers were presented:

For President-Elect; R. E. Seltzer and H. R. Stucky

For Editor and Vice President; C. O. McCorkle, Jr. and R. D. Rehnberg

President Calhoun asked for other nominations for each office.

Motions were passed: That nominations for President-Elect be closed; and that nominations for Editor and Vice President be closed.

John Kling extended advance greetings from New Mexico for the 1957 Conference, to be held at Las Cruces July 15-17.

Motion was passed: That the Association extend its thanks to the officers, and particularly to the Secretary-Treasurer for her fine work.

Officers, 1956-57

President: G. Burton Wood, Oregon State College
President-Elect: H. Ralph Stucky, New Mexico A & M College

Past President: Wendell Calhoun, Agricultural Marketing Service
Editor and Vice President: Rex D. Rehnberg, Colorado A & M College
Secretary-Treasurer: Elizabeth M. Cockrill, 212 Post Office Bldg., Berkeley, California

State Councilman, 1956-57

Arizona ..... James St. Clair
California ..... David A. Clarke, Jr.
Colorado ..... Harry G. Sitler
Idaho ..... Kermit H. Bird
Montana ..... Clive R. Harston
Nevada ..... C. H. Seufferle
New Mexico ..... John O. Kling
Oregon ..... Ray H. Teal
Utah ..... Earnest M. Morrison
Washington ..... Arthur J. Cagle
Wyoming ..... Neff H. Tippets

REPORT OF THE SECRETARY-TREASURER, AFEA 1955-56

Thanks to the effective work of the Membership Committee under the chairmanship of Howard Diesslin, and the stimulus of the Association's projected directory, a net gain of 439 members was recorded this year (Table 1).

TABLE 1. NUMBER OF MEMBERS AND SUBSCRIBERS, AFEA, JULY 1, 1956

Classification	1952	1953	1954	1955	1956	Net Change 1955 to 1956
Regular members	1534	1594	1740	1796	1960	164
Junior members	107	208	187	149	284	135
U. S. libraries and firms	321	304	307	269	335	66
Foreign libraries and firms	317	341	355	351	425	74
Exchanges	0	1	1	1	1	0
Total	2279	2448	2590	2566	3005	+439

Income and expenses

Association cash disbursements exceeded cash receipts for the year by $2,269.11 (Table 2). However, when accounts receivable and bills payable were taken into account the loss was $2,059.86 (Table 3). Since costs of conducting our awards program are financed from grants obtained specifically for this purpose, the financial status of the Association is more accurately reflected in its net worth change. Exclusive of special grants funds and valuing securities at cost, the Association's net worth dropped $771.71 last year (Table 4). Without the increase in membership dues from $5 to $7, the deficit, of course, would have been substantial. During the year $4,000 in government bonds reached maturity. They were sold, but available cash was inadequate to permit reinvestment of any portion of this sum.

Analysis of Association expenses and receipts suggests the need for examining Association policies with regard to major expense items as follows:

1. *Journal* publication cost. Net cost in 1954-55 was $16,304. Net cost in 1955-56 was $19,515.77. Probable cost for 1956-57 will depend upon the policy followed in publishing proceedings numbers. The December, 1955

(Proceedings Number), printing bill alone was $7,861 (vs. $6,298 a year earlier) and the May 1956 issue printing cost was $5,831 (vs. $2,804 a year earlier), due primarily to carrying more of the proceedings from the joint meetings in December.

2. Annual meeting expenses. While this item varies with geographic location, perhaps the Association should carry more of the costs rather than lean heavily on the host institution.

3. Undergraduate and graduate student awards. As emphasis in these areas increases, should the expenses of conducting these programs be charged against the special awards fund?

The large miscellaneous item in expenses was incurred primarily for handling expenses for the AFEA directory and in the membership drive.

TABLE 2. AMERICAN FARM ECONOMIC ASSOCIATION STATEMENT OF INCOME AND DISBURSEMENTS FOR YEAR ENDING JUNE 30, 1956, WITH COMPARISONS (TOTAL ACTIVITIES OF THE ASSOCIATION INCLUDING SPECIAL GRANTS).

	Actual 1954–55	Actual 1955–56	Budgeted for 1955–56
Income item			
AFEA dues, subscriptions	$12,012.57	$18,149.59	$17,000
Sale of back issues, JFE	454.57	588.59	950
Sale of reprints, JFE	806.05	869.47	800
Advertising	300.00	210.00	300
Graduate student section	100.00	—	—
Annual meeting	†	91.68†	—
Awards program	2,255.00	100.00	—
Interest	737.45	372.50*	600
Dividends	2,699.72	2,744.02	2,800
Collected for Western FEA	1,50†	549.50†	
Collected for Canadian AES	†	257.50†	
Sale of membership lists, misc.	15.00	—	50
Total	19,381.84	23,932.56	22,500
Expense item			
Journal printing	15,334.96	18,296.85	18,000
Editing fees, JFE	934.00	1,262.00	1,100
Reprints, JFE	1,141.12	1,036.39	1,200
Purchase, back issues, JFE	592.00	54.00	50
Student section awards	10.00	51.93	150
Awards program expense	6,141.75	1,639.44	
Annual meetings expenses	381.82†	1,773.00†	900
Postage and telegrams	335.20	305.52	300
Office supplies, expenses	456.64	366.53	400
Directory, subscription refunds, misc.	65.01	724.61	120
WFEA dues transferred to WFEA		455.50†	
CAES dues transferred to CAES		225.00†	
Bad checks, non-par items		10.90	
Total	20,892.50	26,201.67	22,220
NET GAIN	−1,510.66	−2,269.11	280**

* Interest earned in period was $666.25. Of this $372.50 is shown here and $293.75 is shown in Table 3 as interest due but not collected.

** To be allocated to Special Grants Fund as share of interest.

† Shown on a net basis in previous years.

Balance Sheet

Valuing marketable securities at cost, the net worth of the Association (all activities) decreased $1,933.36 in 1955-56 (Table 3). If market value of securities were used both at beginning and end of year net worth showed an increase of $3,636.78 rather than a decrease. As indicated earlier the net worth of the Association (securities on cost basis) exclusive of special grants activities dropped only $771.71 (Table 4).

TABLE 3. AMERICAN FARM ECONOMIC ASSOCIATION BALANCE SHEET, JUNE 30, 1955 and JUNE 30, 1956 (TOTAL ACTIVITIES OF ASSOCIATION INCLUDING SPECIAL GRANTS).

	June 30, 1955		June 30, 1956	
Assets				
Current items				
Cash in bank	$4,875.41		$3,579.08	
Interest earned but not collected	—		293.75	
		4,875.41		3,872.83
Investments in U. S. Government Obligations				
Series F Savings Bonds, cost plus increment	1,594.00		1,636.00	
Series G Savings Bonds	4,000.00		—	
Treasury bonds at cost (quoted value 6/30/56 $22,155)[1]	24,045.54		24,045.54	
		29,639.54		25,681.54
Marketable securities at cost (quoted value 6/30/56, $64,906)[2]		33,361.65		33,361.65
Prepaid Journal publication expense		2,803.97		5,831.19
Total		70,680.57		68,747.21
Liabilities and Net Worth				
Liabilities Obligations to WFEA & CAES		—		126.50
Net Worth				
Net worth—				
Balance	6/30/54	72,191.23	6/30/55	70,680.57
Gain or loss for year		−1,510.66		−2,059.86[3]
Total		70,680.57		68,747.21

[1] Quoted value, same securities, 6-30-55 was $22,381.
[2] Quoted value, same securities, 6-30-55 was $59,111.
[3] −$2,269.11, Table 2 − $126.50 owed WFEA & CAES + $293.75 interest earned and not collected + $42 increase in value Series F bonds.

TABLE 4. AMERICAN FARM ECONOMIC ASSOCIATION NET WORTH EXCLUSIVE OF SPECIAL GRANTS FUNDS, JUNE 30, 1955 AND JUNE 30, 1956.

	June 30, 1955		June 30, 1956	
Assets				
Total assets, Table 3	$70,680.57		$68,620.71	
		70,680.57		68,620.71
Libailities				
Balance, special grants funds	11,169.50		9,909.30	
Balance, student section	27.95		—	
Balance, graduate student fund	100.00		100.00	
		11,297.45		10,009.30
Net Worth		59,383.12		58,611.4

Special Grants Fund

In its Special Grants Funds, the Association had a balance of $9,909.30 at the end of the year (Table 5). Awards of $1,600 plus $39.44 in program costs were charged against this account. Interest of $279.24 (2.5% on the beginning balance $11,169.50) was assigned to the fund.

TABLE 5. TRANSACTIONS AND BALANCE IN SPECIAL GRANTS FUND, AFEA

	1954–55		1955–56	
Beginning balance and income				
Balance on hand, first of year	$10,298.78		$11,169.50	
Interest earned during year	257.47		279.24	
Capital contributions received	2,255.00		100.00	
		$12,811.25		$11,548.74
Disbursements from fund				
Awards made during year	1,600.00		1,600.00	
Expense of awards program	41.75		39.44	
		1,641.75		1,639.44
Ending balance		11,169.50		9,909.30

As during previous years, much of the professional time and actual costs of conducting the work of the Association were borne by the officers of the Association and their institutions.

Respectfully submitted

LOWELL S. HARDIN, *Secretary-Treasurer*

REPORT OF THE EDITOR, *JOURNAL OF FARM ECONOMICS*

The number of manuscripts being submitted to the *Journal of Farm Economics* increased during 1955-56, and the 1956 volume is expected to be at least equal in size to the total published in 1955. The 1955 volume, totaling more than 1,500 pages, exceeded 1954 by about 300 pages and 1953 by about 500 pages.

Excellent cooperation has been received from all concerned with one exception. For the past two years, the editors have attempted to expand the number of reviews of bulletins on research work by agricultural economists. We have met only limited success in this effort, and several members have declined to review bulletins during the past year. Contributions from colleagues in reviewing bulletins could be of considerable value to the profession and would be appreciated.

The Editor wishes to express his strong appreciation to all those who have cooperated in the publication of the *Journal of Farm Economics*. George Brinegar, Associate Editor, in addition to his regular duties, handled the correspondence of the office during the summer months of 1956. Robert Clodius, in his able handling of Book Reviews, is contributing a most considerable service to the profession. The members of the Editorial Council have faith-

fully reviewed a large number of manuscripts. Each manuscript in each of the four regular issues of the Journal is normally reviewed by at least two Council members in addition to the Editor. Publication of the Journal is greatly facilitated by the continuing efforts of the members of the Editorial Council. Thanks are also due to the members of the Editorial Council for helping to select the outstanding article published in the *Journal of Farm Economics*.

In addition to help of the Editorial Council, several other members of the Association have aided in reviewing manuscripts. These members are as follows: Holbrook Working, Food Research Institute, Stanford University; J. N. Boles and R. G. Bressler, University of California; Harold F. Breimyer, Trienah Meyers, L. D. Howell, Louis F. Herrmann, Marketing Research Division, Agricultural Marketing Service, Washington, D.C.; George Abshier, North Carolina State College; Raymond P. Christensen, Kenneth L. Bachman, William E. Hendrix, Warren R. Bailey, Orlin J. Scoville, Melvin L. Upchurch, C. W. Crickman, Ronald L. Mighell, Burton L. French, Glen T. Barton, Fred A. Clarenbach, Production Economics Research Branch, Agricultural Research Service; Harlan Lampe, Irving Fellows, Stewart Johnson, Stanley Seaver, Mildred Smith, Thomas Morrison, Marvin Kottke, University of Connecticut.

HAROLD G. HALCROW, *Editor*

REPORT OF THE CHAIRMAN, AWARDS COMMITTEE, AFEA

In early 1956, President Brandt brought all of the varied awards activities of the Association under a single over-all Awards Committee, of which I was appointed Chairman to coordinate the activities of the several subcommittees and to serve in a general administrative capacity. Except for myself, all other members of the Awards Committee were also members of four special subcommittees on Published Research Reports, on Doctoral Theses, on Student Contests, and on Best *Journal of Farm Economics* Article, which developed their own standards for weighing the merits of works within their respective jurisdictions, reached a consensus on those works which most merited awards, and then notified me of their findings. The chairman and members of the first three committees were appointed directly by President Brandt while the committee on the best *Journal* article consisted of the Editor and his staff.

The chairman and members of these four subcommittees not only performed their difficult assignments conscientiously and diligently but without exception met their deadlines, greatly facilitating the fulfillment of my own responsibilities in preparing for the awards ceremony at Asilomar. My own contributions were few, being largely limited to administering the printing and distribution of the announcements; the designing, printing, and preparation for presentation of attractive new award certificates; and the printing of our first official seal, which was designed under the supervision of President Brandt. Hence, the remainder of this report is based upon the reports to me of the chairmen of the several subcommittees.

1. *Awards for Published Research Reports*

Rules

According to the announcements distributed in early February, 1956, the rules for submitting published research were set forth as follows:

1. Three $250 awards, each in a different field of agricultural economics, will be made for publications including bulletins, articles, and pamphlets (books are ineligible) classified in the following categories:

(a) Farm management and production economics
(b) Agricultural marketing
(c) Agricultural prices
(d) Agricultural finance
(e) Land and water economics and conservation
(f) Theory and methodology
(g) Agricultural policy
(h) General agricultural economics

2. Persons submitting items should indicate the field in which they believe the reports should be classified.

3. Selections will be made from published research bearing the publication date of 1955.

4. Eligible recipients must be less than 41 years of age at the time of publication.

5. Members of the Awards Subcommittee for Published Reports will not be eligible to submit papers of their own.

6. Each published report may receive only one award presented by the American Farm Economic Association in 1956. An entry may, however, be considered as eligible for more than one of the following types of awards: (a) Best article appearing in the *Journal of Farm Economics;* (b) Published reports; and (c) Ph.D. theses.

7. Nine copies are requested of each publication submitted for consideration. Fewer copies will be accepted in such cases as articles appearing in national journals available to the judges. In no event should less than three copies be sent.

8. The Awards Subcommittee for Published Reports will consist of nine persons, in addition to the Chairman, representing the various designated fields. The members of the Subcommittee, all of whom will serve as judges, are:

George Brinegar, University of Connecticut
Robert L. Clodius, University of Wisconsin
Willard W. Cochrane, University of Minnesota
Roy E. Huffman, Montana State College
Glenn L. Johnson, Michigan State University
Rex D. Rehnberg, Colorado A. & M. College
Geoffrey Shepherd, Iowa State College
Boris C. Swerling, Stanford University
Norman J. Wall, U.S. Department of Agriculture

9. Publications should be sent directly to the Chairman of this Subcommittee, James P. Cavin, Statistical and Historical Research Branch, Agricultural Marketing Service, Washington 25, D.C., on or before March 15, 1956.

Procedures

Forty published research reports were received and classified by subject matter as indicated by the authors. Each of the judges received all reports in the subject-matter field for which he was responsible and recommended those which he considered qualified for the final judging. For this purpose, each judge received from the subcommittee chairman a standard score sheet and a reporting

form. Ten reports were nominated for the final judging, in which all members of the subcommittee participated.

Recommendations for Awards

On July 2, 1956, Chairman James P. Cavin officially notified me of the following results (in alphabetical order) of the deliberations of the Subcommittee on Published Research Reports:

For Awards of $250 each:

To DALE E. HATHAWAY of Michigan State University for his bulletin, *The Effects of the Price Support Program on the Dry Bean Industry in Michigan,* Michigan Agri. Exp. Sta., Tech. Bul. 250, April 1955 (submitted in the field of Agricultural Policy).

To KENNETH W. MEINKEN of Rutgers University for his bulletin, *The Demand and Price Structure for Wheat,* U.S. Dept. Agri., Tech. Bul. No. 1136, Nov. 1955 (submitted in the field of Agricultural Prices).

To VERNON W. RUTTAN of Purdue University for his article, "The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast," *Journal of Farm Economics,* Feb. 1955 (submitted in the field of General Agricultural Economics).

For Honorable Mention:

To EARL O. HEADY, JOHN T. PESEK, and WILLIAM G. BROWN, for their bulletin, *Crop Response Surfaces and Economic Optima in Fertilizer Use,* Iowa Agri. Exp. Sta., Research Bul. 424, March 1955 (submitted in the field of Farm Management and Production Economics).

To FREDERICK D. STOCKER of the Production Economics Research Branch, Agricultural Research Service, for his study, "The Impact of Federal Income Taxes on Farm People," ARS 43-11, July 1955 (submitted in the field of Agricultural Finance).

Recommendations for Future Procedure

Upon the basis of the experience of this subcommittee, Chairman Cavin has made two recommendations which should receive attention in the future:

(1) The subject-matter breakdown should be improved, particularly with respect to Agricultural Marketing, in which the largest number of reports was submitted. More specifically, should more adequate provision be made for recognizing outstanding contributions in such subfields as physical efficiency and merchandising; and, if so, how might such contributions best be judged since (because they lie largely outside of the usual scope of economics) agricultural economists are not especially qualified to weigh their merits?

(2) The present handicap for multiple authorship (5 per cent for each additional eligible author and 10 per cent for each ineligible co-author) should be made less severe—perhaps 5 per cent for multiple authorship, regardless of number.

2. *Awards for Doctoral Theses*

Rules

According to the announcements distributed in early February, 1956, the rules for submitting doctoral theses were set forth as follows:

1. Three $250 awards will be made for theses prepared by candidates for the Ph.D. degree in any department of Economics or Agricultural Economics.

2. An entry must be submitted by the head of the department to which the thesis was presented in partial fulfillment of requirements for a degree. No department may submit more than one thesis for consideration.

3. Selections will be made from those presented to a graduate school faculty during the calendar year 1955.

4. A published thesis may be entered in both the published report and thesis classes but will be eligible for only one award.

5. Only one copy of an unpublished thesis will need to be sent to the Committee Chairman for consideration. If 2 or 3 are available it will expedite the judging. All copies will be returned after they have been read by the judges.

6. The Awards Subcommittee for Theses will consist of three persons, in addition to the Chairman. These three persons, all of whom will serve as judges, are:

D. Gale Johnson, University of Chicago
Erven J. Long, University of Tennessee
Ronald L. Mighell, U.S. Department of Agriculture

7. Theses should be sent directly to the Chairman of this Subcommittee, Harold B. Rowe, The Brookings Institution, 722 Jackson Place, N.W., Washington 6, D.C., on or before March 15, 1956.

Procedures

Twelve institutions submitted entries to the subcommittee on Ph.D. theses. The twelve theses were examined by all three judges and their appraisals were consolidated into a final rating under the supervision of Chairman Harold B. Rowe, who did not himself participate in the judging.

Recommendations for Awards

On July 6, 1956, Chairman Rowe officially notified me of the following recommendations (in alphabetical order) of the Subcommittee on Ph.D. Theses:

For Awards of $250 each:

To V. JAMES RHODES for his dissertation, *A Theoretical and Empirical Investigation of Consumer Preferences for Beef by Grades in Metropolitan St. Louis, 1954,* Harvard University, 1955.

To ANTHONY M. TANG, for his dissertation, *An Analysis of Southern Economic Development with Particular Reference to Agriculture: Upper Southern Piedmont, 1900-1940,* Vanderbilt University, 1955.

To GEORGE S. TOLLEY, for his dissertation, *Earnings of Labor and Capital in the Food Processing Industries,* University of Chicago, 1955.

For Honorable Mention:

To MARVIN W. KOTTKE, for his dissertation, *A Study of Decision Sharing, Tenure Uncertainty, and the Choice of Farm Enterprise Combinations under Farm Leasing Systems in Minnesota,* University of Minnesota, 1955.

3. *Awards for Graduate Students' Contributed Papers*

In April, 1956, the Executive Committee of the Association authorized a program of awards for papers contributed by graduate students, to be administered

by the Student Section Committee of the Association:

William O. Jones, Stanford University
Raymond Beneke, Iowa State College
Walter Pierce, North Carolina State College
Robert C. Kramer, Michigan State University, Chairman

Because of the late date of establishment of this new awards program, it was somewhat informally conducted and was not included in the Association's printed announcement of February. However, by means of a letter sent to all department heads on April 25, 1956, Chairman Robert C. Kramer announced the program.

Rules

1. Four awards—each consisting of the cash equivalent of the round-trip bus fare from the student's graduate institution to Asilomar, California; a $20 subsistence allotment; and 100 free reprints of his paper as published in the *Journal of Farm Economics*—will be made for papers submitted by graduate students in any department in the United States engaged in training agricultural economists.

2. The students shall be free to choose the subject for their papers, which shall be limited to 20 minutes reading time or 9-10 pages of double-spaced typed manuscript.

3. Each department may submit only one paper, preferably selected by a committee of that department.

4. Department heads shall decide which persons qualify as "graduate students." Full-time staff members working on a degree at their home institutions probably should not be eligible in this competition.

5. Each department head should notify Robert C. Kramer of Michigan State University by May 15 if his department expects to submit a graduate student's paper, which should reach Professor Kramer not later than June 15.

6. The winners of the four awards will be notified by July 15, and will be expected to read their papers at the annual meeting at Asilomar. Their papers will be published as part of the Proceedings of the 1956 annual meeting.

Procedures

Twelve institutions submitted papers on behalf of a graduate student. The twelve papers were judged by all four members of the Subcommittee on Graduate Students' Contributed Papers, whose members were the same as that of the Committee on the Student Section of the Association.

Recommendations for Awards

On July 20, 1956, Chairman Kramer informed me that his subcommittee recommended (in alphabetical order) the following awards:

To DOROTHY C. GOODWIN of the University of Connecticut, for her contributed paper, "Fiscal Needs and Capacity of Connecticut Towns."

To ELMER W. LEARN of Pennsylvania State University, for his contributed paper, "Estimating Demand for Livestock Products at the Farm Level."

To YAIR MUNDLAK of the University of California, for his contributed paper, "Economic Considerations in the Design and Evaluation of Production Forecasts."

To MILTON M. SNODGRASS of Purdue University, for his contributed

paper, "Linear Programming–A New Approach to Interregional Competition in Dairying."

In addition, the subcommittee recommended the following *honorable mention:*

To THOMAS T. STOUT of Ohio State University, for his contributed paper, "Engel's Law and Consumer Expenditure for Food."

Recommendations for Future Procedure

Upon the basis of this initial experience, Chairman Kramer recommends that this competition be continued next year, but with improvement of the scoring sheets, with more precise definition of the term "graduate student," with the requirement that each judge be supplied with a copy of each paper submitted, and with the time table advanced at least 30 days ahead of that used in 1956. I would like to join him in this recommendation and would further recommend that a similar but separate competition for undergraduate contributed papers be established in future years. However, since it is unlikely that more than 12-15 papers will be submitted to each competition, I would also recommend that the awards in the former class be limited to three and the latter to two.

4. *Awards for Best Article in* Journal of Farm Economics

As has been the practice for a number of years, the Editor and Editorial Council of the *Journal of Farm Economics* annually choose the most outstanding article published in the *Journal of Farm Economics* during the preceding calendar year for an award of $100. On July 19, 1956, I was officially notified by Harold G. Halcrow, Editor of the *Journal*, that this year's award-winner was:

GEORGE E. BRANDOW, for his article, "A Modified Compensatory Price Program for Agriculture," published in the November 1955 issue of the *Journal*.

Respectfully submitted,

WILLIAM H. NICHOLLS, *Chairman, Awards Committee*

REPORT OF THE AGRICULTURAL DATA COMMITTEE OF THE AFEA

The Agricultural Data Committee of the American Farm Economic Association offers the following annual report:

(1) The Committee has had three meetings during the past year–at East Lansing, Michigan on August 2, 1955, at the Agricultural Outlook Conference in Washington, D.C. on December 2 and in the Department of Agriculture in Washington on February 24, 1956.

(2) Two subcommittees of the Agricultural Data Committee are at work:

(a) A subcommittee on agricultural data needs in Extension Work, Dr. Dorris D. Brown, Chairman.

(b) A subcommittee on agricultural data requirements in outlook and marketing work, Prof. J. Carroll Bottum, Chairman.

Dr. Brown's subcommittee has worked closely with the Agricultural Extension Service in Washington and has had a number of meetings during the past year. Through the efforts of the subcommittee the Director of the Extension Service sent a letter to each state Director of Extension suggesting that a committee be

appointed in each state to appraise agricultural data available and report on additional needs for extension work in each state. The last report showed that 45 states and 3 territories had complied. The results of the reports from the states which were available at the time were presented to the Agricultural Data Committee of the Association at the meeting in Washington on February 24 by Dorris D. Brown and J. B. Claar of the National Extension Service. The report was subdivided into a number of sections, including the following:

(a) Suggestions for improvement of data.
(b) County and local data needs.
(c) Data on farm business.
(d) Marketing data.
(e) Livestock data.
(f) Crops, fruit, vegetables data.
(g) Family living and community improvement data.

A detailed summary of the report was furnished each person in attendance at the meeting.

Subsequently, a preliminary report giving a summary of the various state reports was also issued by the Agricultural Extension Service to state directors.

The second subcommittee dealing with data needs in outlook and marketing work of which Prof. Bottum is chairman had its first meeting in Chicago in November 1955 and a second meeting at Iowa State College on July 16, 1956. This subcommittee has pointed out the need for more frequent and more complete data on hogs, beef cattle, dairy cattle, and certain crops. It also is concerned with the possibilities of shortening the time between dates when information is obtained and when it is released. This subcommittee is giving priority to its work on livestock with particular emphasis on data relating to hogs and beef cattle.

(3) Other activities of this Committee include the following:

(a) At the November meeting of the commissioners, secretaries and directors of agriculture held in New Orleans the objectives of the Committee were presented by Director D. N. McDowell of the Wisconsin State Department of Agriculture and a resolution was adopted in which the group pledged its support to programs for improving agricultural data to be developed by the committee, and that body has asked to be kept informed of the progress made.

The issue was also taken up at the summer 1956 meetings of the southern and north-central commissioners of agriculture and at the Executive Committee meeting of the National Association in April at Paris Landing, Tennessee, and supporting resolutions were passed. The commissioners are asking the Secretary of Agriculture to expedite a study of the needs in the agricultural data field and will cooperate in the undertaking.

(b) At a meeting of the Association of Land Grant Colleges at East Lansing, Michigan in November the work of this committee was presented to the Organization and Policy Committee of both the Extension and the Agricultural Experiment Station workers. Both committees voted to prepare a resolution to support the work of the Committee. The Extension Committee at its June 1956 meeting took further action in this direction and initiated it by the appointment of a joint committee between the Extension Service and the experiment stations to work with the Secretary of Agriculture in supporting the work of strengthening the agricultural data activities, particularly in the states so as to supply the local and state data needed for new state programs.

(c) At the National Outlook Conference on November 22, 1955 an evening session was devoted to the issues with which the Agricultural Data Committee is trying

to deal. In this way we outlook workers got a fuller understanding of some of the agricultural data problems and some of the things that may be done to meet the requirements at the local and state levels. A number of suggestions were obtained at this meeting.

(d) The committee also presented the data problems to officials of the American Farm Bureau Federation.

(4) The Chairman of the Committee again surveyed agricultural extension directors and Wisconsin county agents in 1956 relative to the data requirements by strata, that is, the national, state and local levels—as was done in 1954. The results of these surveys show a definite trend in requirements to more state and local information as can be seen from the following tables:

AGRICULTURAL DATA REQUIREMENTS NATIONAL, STATE, AND COUNTY
Surveys 1954–1956

(Percentages shown are straight averages of reports for each group)

TABLE I. USE OF AGRICULTURAL DATA

	1954	1956	Points change in 2 years
1. Directors of agricultural extension			
a. National data	27.0	21.0	−6.0
b. State data	31.2	29.4	−1.8
c. Data for counties or other within-state subdivisions	41.8	49.6	+7.8
Total	100.0%	100.0%	
2. County agricultural agents in Wisconsin			
a. National data	15.2	12.8	−2.4
b. State data	27.5	24.5	−3.0
c. Data for counties or other within-state subdivisions	57.3	62.7	+5.4
Total	100.0%	100.0%	

TABLE II. NEW REQUIREMENTS, DATA NOT NOW AVAILABLE

	1954	1956	Points change in 2 years
1. Directors of agricultural extension			
a. National data	14.7	11.3	−3.4
b. State data	27.0	22.0	−5.0
c. Data for counties or other within-state subdivisions	58.3	66.7	+8.4
Total	100.0%	100.0%	
2. County agricultural agents in Wisconsin			
a. National data	13.3	12.3	−1.0
b. State data	27.6	23.7	−2.9
c. Data for counties or other within-state subdivisions	59.1	64.0	+4.9
Total	100.0%	100.0%	

Since the function of information is to help make decisions, the growing importance of the emphasis on local and state needs stand out. (For a report on the original surveys in 1954 see *Journal of Farm Economics*, Vol. 34, No. 5, Dec. 1954, Page 1226 to 1239.)

(5) In April 1956, Dorris D. Brown, the Secretary of the Committee, prepared a major report under the title "Agricultural Data Requirements of Government, Farmers, and Industry for National Progress." In it the history of the problems with which the Committee is trying to deal is briefly reviewed and a brief report is made on studies already undertaken and a program of proposed activities.

This report was discussed with various individuals in the Department of Agriculture and on June 7 the Chairman of the Agricultural Data Committee and the Secretary, along with Commissioner Parke Brinkley of Virginia representing the Association of Commissioners, Secretaries and Directors of Agriculture appeared before the Subcommittee on Appropriations in the House of Representatives. The group was very well received and as a result, Chairman Jamie L. Whitten of the Committee asked the Secretary of Agriculture to study the agricultural data needs which have been pointed out by the Committee of the American Farm Economic Association. He asked the Secretary to work with this committee and to make a report to the next Congress.

(6) A section of papers on "Changing Requirements in Agricultural Data" will be presented at the annual meeting of the American Farm Economic Association at Asilomar, California on August 27. For next year it is planned to have a section of papers at the annual meeting which will grow out of the work of the second subcommittee on agricultural data requirements for marketing and outlook work.

The committee has had splendid cooperation from various groups and leaders for which we are grateful. Special appreciation is due to Dr. Joseph Ackerman and the Farm Foundation. Not only has Dr. Ackerman served faithfully as a consultant to the Committee, but the Foundation has paid expenses of some members who did not have other resources for expenses in attending meetings.

The Committee has had an active year and much of its work is unfinished. It is recommended that the committee be continued for the next year.

Committee Members

GEORGE AULL
FRANK V. BECK
GEORGE T. BLANCH
J. C. BOTTUM
DORRIS D. BROWN
GEORGE MONTGOMERY
EMERY C. WILCOX
WALTER H. EBLING, *Chairman*

Consultants

JOSEPH ACKERMAN
J. D. BLACK
RAY HURLEY
O. V. WELLS

REPORT OF THE DIRECTORY COMMITTEE, AFEA

This Committee was initiated late in January 1956 with the appointment of the Chairman, and soon thereafter with these additional members: Horace G. Porter, Agricultural Economist, Federal Reserve Bank, Richmond, Va.; Shelby A. Robert, Market Research Director, American Dairy Association, Chicago, Ill. and, at the suggestion of the Chairman, Dr. A. D. Seale, Jr., Mississippi State College. Since no provision was made for a meeting of the Committee, all contacts have been by correspondence, telephone, and individual conferences as opportunity permitted. This has been a very serious handicap in formulating

adequate working policies and procedures. It can hardly be said that what has been done has been Committee action in the real sense.

The Committee immediately began the task of determining its area of work, which centered (1) on the preparation of a brochure announcing plans for the directory, and (2) on the preparation of a questionnaire for personal data to be included in the directory. The brochure was to be used in the membership drive. There was also the matter of how much information was to be included in the questionnaire. The Chairman assumed, on initial notice at least, that the task for 1956 might elaborate some on what had been done in the Handbook of 1939, by emphasizing perhaps title and present employment. The idea of a "Who's Who" had not seemed at the moment to be "in the picture" in view of the short time during which consideration could be given to initiating the enterprise. However, subsequent discussions and developments completely changed this objective.

During March efforts were made to see what had been done in other directories and to shape up a questionnaire for limited personal information. The initial plan was to prepare a brochure announcing the Directory and indicating its basic content. This would then go to the Membership Committee which was ready to initiate the drive for new members. While the intent was to get this out first and then take more time in shaping up the questionnaire, later developments required that the two should be made ready to be circulated together. Thus, most of April was spent in getting these in shape for the printer and getting them printed, including the necessary envelopes for sending them out to present members and to the Membership Committee to use in soliciting new members. Return envelopes routed the membership applications and the questionnaires to Dr. Lowell S. Hardin, Secretary-Treasurer, for final checking for active membership. The materials were received from the printer early in May and immediately distributed.

About 4,000 copies each of the brochure, the questionnaire and return envelopes were printed. About 2,200 brochures and questionnaires were sent directly to members using a mailing list which was supplied by Dr. Hardin through Banta Press, which mails out the *Journal*. The extra quantity, not needed for existing members, was sent to the Membership Committee for use in contacting prospective new members.

In the period which immediately followed, the Chairman assembled several segments of the supplementary information indicated in the brochure. In fact, much of it is now fairly complete, except for the parts on foreign membership and on agencies, businesses, and institutions, other than land-grant institutions, which employ agricultural economists. A few gaps remain in some of the other material due to inadequate records or researches so far. Your President has been most helpful in providing current material for this section of the proposed report.

The Chairman has received, through Dr. Hardin, two sets of individual membership cards and one set (strip) of subscribers from the Banta Press to facilitate the work. By way of processing, the questionnaires have been arranged in alphabetical order, and a set of he membership cards have been so arranged, in order to have a complete membership list. Some individuals did not answer the questionnaire, so will be listed by name and address only. Also, a set of the membership cards have been arranged by geographical areas. The subscribers, not individuals, will be added to this to complete the list. Since

some difference in time is involved between the membership lists and the questionnaires, cross checking of these will be needed in the final editing.

A proposed bibliographical sketch, as a sample, was prepared (using that of the Chairman as the example) and circulated to the Committee and to Dr. Brandt for specific suggestions. This has been through one revision and resubmitted for further study. It will probably be about as now prepared. The main problem is one of getting the material briefed as fully as possible without doing serious injustice to the objective intended by the directory.

A few more questionnaires may be received, after which the final processing task should proceed. The present number is approximately 1,653.

Although it is difficult to estimate the cost and personnel required to complete this task on the scale intended, I think the President and other officers, should be fully apprised that it will take considerable time and funds. My estimate is that it will take a good secretary-typist about five to six months to do the necessary arranging and checking of the lists and typing them once the bibliography code is settled on. Also, such a person would need to do the coding, but could copy directly from the questionnaire to the manuscript page. Also, it will take the time of an agricultural economist (readily available) to examine and assist the secretary in making a lot of decisions on how to handle items in the questionnaire, where the respondent has departed from the instructions.

The Committee needs additional members to handle certain phases of the work such as the names, especially for Asiatic areas, and someone in USDA to examine names and agencies of those in government service.

Members of the present Committee are not in position to give any appreciable additional time to this task. It is a job for virtually full-time personnel, or for a professional bibliographer. Decisions on these important matters seem to me to rest first on positive action of the Executive Committee.

S. A. ROBERT, JR
H. G. PORTER
A. D. SEALE, JR.
R. J. SAVILLE, *Chairman*

REPORT OF THE COMMITTEE ON RECOGNITION OF OUTSTANDING AGRICULTURAL ECONOMISTS

A committee was appointed recently by the Executive Committee to explore the desirability of recognizing outstanding members of the American Farm Economic Association. The matter was discussed by letter or in person with all heads of departments of agricultural economics and many other interested individuals.

The majority thought it was a good idea and that we should proceed in the development of some type of program to honor outstanding members of our profession. A few did not favor the establishment of such a program. The reason generally given was that any program of this kind would inevitably honor the older, and better known, members who have already been recognized in other ways. Many suggested that such a program be limited to honor only a few persons.

The committee studied the awards program of the American Society of

Agronomy, Econometric Society, American Dairy Science Association, American Economic Association, American Forestry Association, American Marketing Association, American Association for the Advancement of Science, American Society of Agricultural Engineers, American Statistical Association, and the Soil Conservation Society of America. After giving careful consideration to the thoughts expressed by members of the American Farm Economic Association and after a review of the various awards programs, the committee recommends the establishment of the following awards program:

(1) Title: "Fellow of the American Farm Economic Association."
(2) Criteria for selecting fellows: The main consideration would be continued contribution to the advancement of agricultural economics. This would include achievements in the fields of research, teaching, extension, administration, or business. It might also include authorship.
(3) Procedure for selecting fellows: AFEA members would be asked to submit names of possible candidates to the Executive Committee. The Executive Committee would select from the nominees not more than ten for consideration by the membership at the time officers are elected. A separate envelope would be enclosed for use in returning the ballot for fellows at least one month prior to the annual meeting of the AFEA. The first year the membership might be allowed to vote for a maximum of ten fellows. In succeeding years the maximum number elected would be three.
(4) Nature of the award: The committee recommends that the fellows be presented a framed citation and that the citation and the name of the recipients be published in the *Journal*.
(5) Eligibility: All members of the AFEA would be eligible.

F. F. ELLIOTT
HAROLD B. ROWE
F. V. WAUGH
JOSEPH ACKERMAN, *Chairman*

REPORT OF COMMITTEE ON FINANCING GRADUATE STUDENT ATTENDANCE AT THE AMERICAN FARM ECONOMIC ASSOCIATION MEETING

Since receiving the assignment to investigate possibilities of obtaining funds to enable graduate and undergraduate students to attend AFEA meetings, we have had an opportunity to discuss the matter with many people. Almost everyone we would approach for funds for this purpose seemed to feel that bringing students to meetings was the responsibility of the Association and should be financed by the Association itself—through an increase in membership dues if necessary. However, many of the people contacted indicated that they might be interested in making funds available for various other specific purposes.

In view of this general consensus we felt it best to clear the matter with the Executive Committee before proceeding with the development of a program along this line.

T. K. COWDEN
K. A. FOX
JOSEPH ACKERMAN, *Chairman*

REPORT OF THE EMPLOYMENT COMMITTEE, AFEA

Members of this committee have acted informally during the year in getting prospective employers and employees together. This has been based mainly on information received prior to or at the East Lansing meeting but the requests during the year have added to the information.

Arrangements, including mailing out forms, have been made for another employment "clearing house"—in conjunction with the Asilomar meeting. The merits of this service are being studied by the committee.

It is anticipated that a list of *vacancies* and one of *applicants* will be mailed to members. Information from the Asilomar meeting may be used for the listing but announcement of the service needs to be made before the service is given proper impetus.

D. B. DeLOACH
W. E. FOLZ
R. A. KING
O. C. STINE, *Consultant*
NORMAN NYBROTEN, *Chairman*

REPORT OF THE COMMITTEE ON FINANCE, AFEA 1955-56

Following are reports on marketable securities (stocks and bonds) and on government securities held by the Association.

Our financial reports are in terms of cost and market prices. Market values as of June 30, 1956 are listed for the stocks.

Stocks

In summary, our stock portfolio shows this activity for the year:

		Value
	At Cost	*Quoted*
Stocks* on hand June 30, 1955	$32,389.84	$58,139.07
Change in securities account during year	0	5,795.74
Value of shares June 30, 1956	$32,389.84	$63,934.81
Dividends received on stocks during year	2,744.02	
Percent return on stocks valued at cost of $33,361.65		8.23%
Percent return on stocks valued at market of 6/30/55		4.74%

Bonds

	At Cost	*Quoted*
Bonds on hand June 30, 1955	$30,611.54	$28,947.40
Changes in bond account during year	— 3,958.00	— 4,183.60
Value of bonds June 30, 1956	$26,653.54	$24,763.80
Net interest income on bonds during year at 2½%		$708.25
Net interest income on bonds at market 8/21/56		3.20%

* Excludes Chi. Mil. and St. Paul R. R. security listed on Merchantable Stocks and Bonds Record.

AMERICAN FARM ECONOMIC ASSOCIATION MERCHANTABLE STOCKS AND BONDS RECORD, JUNE 30, 1956

	6-30-55		Additions in year		Balance end year		Dividends Rec'd	Market Value	
	No. shares	Orig. cost	No. shares	cost	No. shares	cost		6-30-55	6-30-56
Am. Smelting Pfd.	10	$1,665.30			10	$1,665.30	$ 70.00	1,665.00	1,602.50
Am. Tel & Tel	28	4,666.23			28	4,666.23	343.84	5,120.50	5,040.00
Borden Company	55	2,162.41			55	2,162.41	154.00	3,568.13	3,258.75
Chase-Manhtn. Bank	38	1,036.01			38	1,036.01	101.40	1,938.00	1,819.25
C & O RR	40	2,020.92			40	2,020.92	135.00	2,125.00	2,540.00
Clark Equipment	75	2,200.67	75	—	150	2,200.67	300.00	5,268.75	8,962.50
Commnw. Edison	56	1,803.60			56	1,803.60	123.73	2,373.00	2,268.00
Corn Prod. Ref.	75	1,891.05			75	1,891.05	110.51	2,156.25	2,212.50
E. I. DuPont	25	2,403.25			25	2,403.25	187.50	5,743.75	52,75.00
General Electric	150	1,920.57			150	1,920.57	270.00	7,968.75	9,150.00
Liggett & Myers	50	2,494.55			50	2,494.55	250.00	3,212.50	3,337.50
N. Ill. Gas	17	317.05			17	317.05	13.60	340.00	312.33
Owens Ill. Glass	35	2,925.35	35	—	70	2,925.35	166.25	4,296.25	5,162.50
Sears Roebuck	50	1,845.38	101	—	151	1,845.38	157.75	4,687.50	4,662.12
Std. Oil, Indiana	100	2,037.40			100	2,037.40	239.10	5,225.00	6,012.50
Std. Oil, N. J.	3	68.50	6	—	9	68.50	17.25	385.50	514.12
Swift and Company	40	931.60			40	931.60	104.00	2,065.00	1,805.00
Chi. Mil. & St. Paul	*	971.81			*	971.81	*	972.00	972.00
Total		33,361.65		—		33,361.65	2,744.02	59,110.88	64,906.02

* R. R. Bond, not a stock. $28.75 received treated as interest income.

AMERICAN FARM ECONOMIC ASSOCIATION GOVERNMENT SECURITIES, JUNE 30, 1956

		Cost 6-30-55	Added	Sold	Balance 6-30-56	Int. Rec'd.	Maturity	
							Value	Date
US Treasury	128966F	$ 5,153.39			$ 5,153.39	$125.00	$5,000	12-15-67/72
	128967H	5,153.39			5,153.39	125.00	5,000	12-15-67/72
	128968J	5,153.39			5,153.39	125.00	5,000	12-15-67/72
	583153C	1,028.84			1,028.84	25.00	1,000	12-15-67/72
	583154D	1,028.84			1,028.84	25.00	1,000	12-15-67/72
	583155E	1,028.84			1,028.84	25.00	1,000	12-15-67/72
	583156F	1,028.84			1,028.84	25.00	1,000	12-15-67/72
	452801A	993.75			993.75	25.00	1,000	6-15-67/72
	414789K	993.12			993.12	25.00	1,000	6-15-67/72
	414790L	993.13			993.13	25.00	1,000	6-15-67/72
	414791A	993.13			993.13	25.00	1,000	6-15-67/72
	58025E	496.88			496.88	12.50	500	6-15-67/72
US Savings	M1650337G	1,000.00		$1,000.00		12.50		
	M1650338G	1,000.00		1,000.00		12.50		
	M1733821G	1,000.00		1,000.00		12.50		
	M1733822G	1,000.00		1,000.00		12.50		
	M1663199F	797.00			818.00		1,000	5-11-62
	M1663200F	797.00			818.00		1,000	5-11-62
Total		$29,639.54		$4,000.00	$25,681.54	$637.50*		
Increase in 2 Series F Bonds			42.00			42.00		
		$29,639.54	$42.00	$4,000.00	$25,681.54	$679.50		

* To $637.50 add $28.75 for R. R. bond interest from footnote previous table for total of $666.25 interest income.

1. We recommend that institutional membership (i.e., libraries and firms) be increased from $7.00 to $10.00 per year.
2. We also recommend that a new "Sustaining Membership" be established for institutions at $100 per year.

P. E. ANDERSON
H. W. ANWAY
E. T. BAUGHMAN
E. G. BENNION
L. S. HARDIN
R. I. NOWELL, *Chairman*

REPORT OF 1956 MEMBERSHIP COMMITTEE, AFEA

Total membership in the Association on July 1, 1956 was 3,005, as compared with 2,566 on July 1, 1955—an increase of 17 percent. Secretary-Treasurer L. S. Hardin reports the results of the drive as follows:

"In connection with the Membership Drive a total of 546 subscriptions were received. It appears that about one-half of this 546 were new members, and the other half were reinstated old members. It is impossible to determine how many of these old members would have renewed their membership had it not been for the Membership Drive and for the Directory. I suspect that we can credit to the Membership Drive at least 400 of these 546 memberships. Perhaps we should credit even more."

Secretary Hardin has classified these 546 members as follows:

Junior members (graduate students)	95
Professional people on college staffs	182
Professional people in industry	45
USDA personnel	27
Occupational classification unknown	182
Institutional subscribers (largely libraries)	15
Total	546

We believe that a large percentage of the unkown classifications (182 subscriptions) are U. S. Department of Agriculture and industry employees.

This is the largest numerical and percentage increase in membership from one year to the next in the recent history of the association. Certainly, this increase is due in a large measure to the "tie-in" of the membership drive with the 1956 Directory of the American Farm Economic Association.

J. Russell Ives headed the membership drive in industry, Harry C. Trelogan in the U. S. Department of Agriculture, and Howard G. Diesslin among the colleges. These individuals were ably assisted by committees representing various agencies of the U. S. Department of Agriculture, different agricultural industries, and all departments of agricultural economics in the United States.

Eighteen hundred copies of the following materials were distributed for use in the drive:

(1) Letter from President Brandt explaining the benefits of membership.

(2) Announcement of the 1956 Directory of the American Farm Economic Association.

(3) Questionnaire requesting personal data for listing in the Directory. Of the 1,800 copies of each of these materials, 500 were used in the U. S. Department of Agriculture, 500 in industry, and 800 among the colleges.

A fairly complete file of all correspondence, committees, forms, and other materials used in conjunction with the membership drive has been turned over to President Brandt for the permanent files of the Association.

Respectfully submitted,

J. RUSSELL IVES
HARRY C. TRELOGAN
HOWARD G. DIESSLIN, *Chairman*

REPORT OF THE AUDITING COMMITTEE, AFEA

Upon request of the officers of the American Farm Economic Association, we have examined the accounts and the statements prepared by the Secretary-Treasurer, Lowell S. Hardin for the period July 1, 1955 to June 30, 1956.

We have verified the income statement of the Treasurer against the gross totals shown in the receipts journal. We have also verified the disbursement statement of the Treasurer against the gross totals in the disbursements journal and also the individual disbursements against the check-book record. The June 30, 1956 bank statement of cash-on-hand corresponds with the Treasurer's report on the balance sheet. We checked the Treasurer's securities record and verified its agreement with the report of the Investment Committee. The Treasurer's reports of financial position of the Association accurately reflect his records of transactions and financial position of the Association for the period. However, it should be pointed out that the records as now kept understate the current asset position of the Association since the securities are carried at cost instead of their current market value.

We respectfully bring to the attention of the members that the business transactions of the Association have reached a volume which evidently requires a substantial amount of time and skill. Some consideration should be given to the possibility that in the near future a salaried position should be created to handle the affairs of the Association.

R. B. WILSON
R. L. KOHLS

REPORT OF THE ELECTION TELLERS

The Teller's Committee counted the ballots on August 26, 1956, with the following results:

President Elect ..... Harry C. Trelogan
Vice President ..... Carl P. Heisig
John F. Timmons
Secretary-Treasurer ..... Lowell S. Hardin

ROY E. HUFFMAN, *Chairman*
Tellers Committee

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE AND COMMITTEE PERSONNEL OF THE AMERICAN FARM ECONOMIC ASSOCIATION, SARATOGA, CALIFORNIA, AUGUST 26, 1956

Present: Brandt, James, Nicholls, Hardin, Halcrow, Sinclair, Case, Hopkins, Folz, Nowell, Ebling, Ackerman, Fox, Trelogan, Calhoun, Turner, Witt.

1. The meeting was called to order by President Brandt.

2. The minutes of the December 30, 1955 meeting of the Executive Committee were approved.

3. President Brandt reported that Dr. Saville, Chairman of the Association Directory Committee, needs assistance. Costs of bringing the directory to completion were estimated for 4,000 copies of a 200-page volume carrying 1,700 bibliographies at around $2,000 for editing and $4,800 for publication. An estimated revenue of $4,500 was suggested as possible. Distribution is now to be thus: (a) Individual members as of July 1, 1956 will receive their copies without additional charge. (b) Institutional subscribers and individuals who were not members on July 1, 1956, will be charged $3 per copy. (c) New member institutions will be charged $5 per copy. The new officers will need to carry this program through to completion.

4. Ackerman moved that a total expenditure of up to $8,000 for production of the directory be authorized. It was understood that as much as possible of this sum was to be recovered from advertising or other revenue. Carried.

5. Nowell reported that members of his committee had contacted the large advertising agencies without finding any interest in advertising in our *Journal*. He suggested sustaining memberships as the most desirable source of outside support.

6. Nicholls moved that in future years three equal awards should be made in the graduate student paper competition; that this should be a continuing part of the awards program of the Association; that this should be financed by regular awards funds. Carried.

7. James moved that the award in the graduate student paper competition be round-trip bus fare to the place of meeting plus a $25 honorarium. Carried.

8. James moved that awards in each of the other three competitions sponsored by the Association (published research, Ph.D. thesis and *Journal* paper) be in the amount of $250. This raises the award for the *Journal* paper from $100 to $250, leaves others as they are. Carried.

9. Nowell reported further on the work of the Finance Committee. He moved that the following recommendations be carried to the membership:

(a) That memberships of institutional subscribers to the *Journal of Farm Economics* be raised from $7 to $10. Carried.

(b) That sustaining memberships of $100 per year be authorized and solicitation started. Carried.

10. Plans to shift the office of the Secretary at the end of the 1956-57 year were discussed. Brandt reported that Glen Hedlund, Cornell University, may take the assignment.

11. Ackerman presented the report of the Committee on Recognition of Outstanding Economists. After amendment, the report was accepted for submission to the membership.

Adjourned.

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE OF THE AMERICAN FARM ECONOMIC ASSOCIATION, ASILOMAR, CALIFORNIA, AUGUST 27, 1956

Present: Brandt, James, Nicholls, Fox, Ackerman, Halcrow, Witt, Hardin.

1. Minutes of Saratoga meeting of the Executive Committee were read and approved.

2. Chairman Nicholls made the report of the Association Awards Committee. The need for further clarification of criteria for judging reports was discussed. The report was accepted and Treasurer was instructed to draw the checks for presentation to the award winners.

3. Secretary-Treasurer Hardin presented his report which was accepted. Discussion of costs of publishing the *Journal* and particularly of the cost of publishing the Proceedings Number ensued. The low cash balance of the Association was brought to the attention of the Executive Committee.

4. A copy of the report of the Auditing Committee was presented and was accepted.

5. The recommendations of the Finance Committee were reviewed. That committee's recommendation to increase the subscription rates to institutional subscribers was discussed in some detail. One member of the Executive Committee indicated that he would argue against such a recommendation when it came before the annual meeting.

6. Ackerman presented the report on his group on the problem of financing graduate student participation at the annual meeting. The report was accepted for filing.

7. The report of the membership drive under the chairmanship of Howard Diesslin was accepted for filing.

8. Association Directory Committee chairman Saville's report was accepted for filing.

9. Agricultural Data Committee chairman Ebling's report was accepted for presentation at the annual meeting. President Brandt reported that he had appointed Mr. Ebling as the representative of the American Farm Economic Association to serve as a member of the Council of Population and Housing Census with the Director of the 18th Decennial Census. In the event that Ebling is unable to attend, association member D. Brown will serve as an alternate.

10. Student activities and competition in debate and public speaking were reported on by Vice President Witt. Kramer was unable to attend the meetings and much of the actual work of conducting the activities of the student groups at the California meeting was being handled by William O. Jones. The need for further analysis in the entire student situation was pointed up.

It was moved that $75 be granted to the student group for supplies and postage to finance its newsletters, production and distribution. This recommendation carried with the understanding that final action would be taken by the new Executive Committee.

The possibility of Association support of the cost of the attendance of the president and secretary of the student group at the annual AFEA meeting was discussed. No action was taken on this proposal.

11. The report of the Association's Employment Committee from Folz for Chairman Nybroten was accepted for further consideration.

12. It was reported that the Committee on Cooperation with Agricultural

Economists Abroad was in a position to make a progress report which Chairman Case would render at the annual business session.

13. The report of Editor Halcrow was accepted with thanks. The problem of exchanging issues of the *Journal of Farm Economics* with interested foreign groups as well as local ones was again discussed.

The recommendation that the Editor be authorized to enter into exchange subscriptions with foreign organizations comparable to the American Farm Economic Association carried. The Editor will, therefore, advise the Secretary-Treasurer of associations with which he would like to enter into exchange relationships.

14. Committee adjourned until after the annual business meeting of the association.

MINUTES OF THE ANNUAL BUSINESS MEETING, AFEA, AUGUST 28, 1956

President Karl Brandt called the meeting to order at 8:15 a.m. in Merrill Hall, Asilomar. He presented his report which is appended.

The Secretary-Treasurer's report was presented and approved by the membership.

Chairman Raymond Wilson of the Auditing Committee presented that committee's report, a copy of which is appended.

Chairman R. I. Nowell of the Committee on Finance reported that careful analysis of the investment portfolio of the Association by three firms resulted in no suggestions for changes in our present investments. The need for additional revenue by the Association was discussed. Based upon studies of his committee, Nowell moved that the association establish a sustaining membership category with annual dues to such members of $100. This motion carried.

Nowell moved that the membership fee for institutional subscribers to the *Journal of Farm Economics* (libraries and firms) be increased from $7 to $10. After considerable discussion, this motion was lost.

I. W. Duggan moved that the annual dues of all members in the Association be raised from $7 to $8.

Following discussion, Harry Wellman moved that the Duggan motion be ammended so that the responsibility for changing dues in the Association be transferred to the Executive Committee and that the Executive Committee be empowered to raise the dues to something more that $7, but to an amount not to exceed $10 per year, and that the exact amount and the timing of such a dues increase be left to the discretion of the Executive Committee.

The Wellman amendment carried.

The Duggan motion as amended carried.

The Finance Committee report was accepted and is appended.

Editor Harold Halcrow made his report (attached) which was accepted with appreciation.

The report of the Committee for the Publication of the 1956 Directory of AFEA members was presented by committeeman S. A. Robert, Jr., in the absence of the Chairman R. J. Saville. This report was accepted with thanks (appended). H. G. Diesslin, Chairman of the Membership Drive Committee made the report for group which is appended.

Joseph Ackerman presented the report of his committee to Finance Graduate Student Attendance at meetings of the Association (appended).

(It now being 9:30 a.m. and time for the schedule of the morning session to begin, the business session of the Association was adjourned until 7:30 p.m. at which time it was resumed. The results of the election of officers was presented by the tellers' committee (report appended) R. E. Huffman, Chairman, at the general session at 9:30. The new officers were presented by G. B. Wood as chairman of the luncheon session).

W. H. Ebling, Chairman Agricultural Data Committee, presented the report of his group which was accepted.

H. C. M. Case, chairman of the Committee on Cooperation with Agricultural Economists Abroad, reported on the studies of his Committee (report attached) and recommended continuance of Committee activity in this area.

W. H. Nicholls, Chairman of the Association Awards Committee, presented the Awards Committee Report and made the awards as outlined in the details of his Committee statement.

J. C. Bottum, speaking on behalf of Chairman G. B. Wood of the Resolutions Committee, moved the adoption of the following resolution:

The membership of the American Farm Economic Association and the Western Farm Economic Association meeting in joint session at Asilomar, California from August 26-29, wishes to express its appreciation and gratitude to many persons and organizations who contributed so much to make this meeting a delightful and stimulating experience.

Be it, therefore, resolved that the membership instruct the Secretary-Treasurer of the AFEA to convey copies of this resolution to the following:

To the Local Arrangements Committee and particularly to its co-chairman, Roger W. Gray of Stanford University and James N. Boles of the University of California, a special thank you for the smooth and effective handling of the preconference and conference details.

To the Ladies Hospitality Committee and particularly its chairman, Mrs. Holbrook Working of Stanford, California, special appreciation for the many interesting and enjoyable tours, teas and special events for both the women and children attending the conference.

To the officers of the associations and to the host institutions, the Giannini Foundation of Agricultural Economics of the University of California and the Food Research Institute of Stanford University, appreciation for their vision in scheduling this meeting in such a restful and friendly atmosphere and for the hours of patient planning involved in making the program and the meeting so highly successful.

To the Preconference Farm Tour Committee and especially to Doyle Reed, Phillip Parsons and Loy Sammet for a very complete and interesting picture of California agriculture and its food-processing facilities.

To the many special committees of the American Farm Economic Association which have been active during the past year in furthering the work of the Association and in particular to the following:

1. W. H. Nicholls, Chairman of the Awards Committee and his subcommittee chairmen:
   a) H. G. Halcrow—Best *Journal* article
   b) J. P. Cavin—Published research reports
   c) H. B. Rowe—Doctoral theses
   d) R. C. Kramer—Student contests
2. Robert C. Kramer, Chairman, Committee on the Student Section.
3. Joseph Ackerman, Chairman of Committee on Honors for Outstanding Agricultural Economists.
4. Norman Nybroten, Chairman of Employment Committee.

5. H. C. M. Case, Chairman of Committee on International Cooperation.
6. Joseph Ackerman, Chairman of the Committee to Financing Graduate Student Attendance.
7. W. H. Ebling, Chairman of the Agricultural Data Committee.
8. R. I. Nowell, Chairman of the Committee on Finance.
9. R. B. Wilson, Chairman of the Audit Committee.
10. R. E. Huffman, Chairman of the Tellers' Committee.
11. H. G. Diesslin, Chairman of the Membership Committee and his subcommittee chairmen:
    a) H. C. Trelogan—U.S.D.A. Membership
    b) J. R. Ives—Business and Industrial Firms
12. R. J. Saville, Chairman of the Directory Committee.

To the management and staff of the Asilomar conference grounds, especially Mrs. Roma Philbrook, appreciation for the fine hospitality, good food and many courtesies which were enjoyed by all.

The resolution was unanimously approved.

Outgoing President Karl Brandt presented incoming President Brooks James. President James spoke of the deserved praise of the work of Karl Brandt on behalf of the association. He repeated the announcement that the 1957 meetings will be held August 28-31 at Lake Junaluska, North Carolina. He further announced that winter meetings of the Association in cooperation with the American Economic Association and related groups December 27-29 at Cleveland, Ohio. Five sessions, one per half day will be presented.

Suggestions relative to possible meeting places for this association for the summer of 1958 were sought.

There being no other business, meeting was adjourned at 8:45 P.M.

Respectfully submitted,

L. S. HARDIN, *Secretary*

MINUTES OF THE NEW EXECUTIVE COMMITTEE MEETING, TUESDAY, AUGUST 28, 1956

Present: James, Ackerman, Heisig, Timmons, Brandt, Halcrow, Trelogan, Calhoun, and Hardin.

1. The minutes of the preceding Executive Committee meeting were read and approved.

2. Association Directory. It was agreed that Joseph Ackerman would assist in getting the directory edited and ready for publication. It was further agreed that Karl Brandt would assume responsibility for committee chairmanship to obtain advertising support for the directory and at the same time would follow through on obtaining advertising for the *Journal of Farm Economics*. Brandt and his committee were authorized to examine and to establish what seemed to be desirable schedule of rates for advertising in both sets of publications.

It was moved that 4,000 copies of the Association directory be authorized. Carried.

It was moved that Ackerman in consultation with Brandt and James be authorized to solicit bids and determine the method and the firm to produce the directory. Carried.

3. Awards to outstanding agricultural economists. The action of the association following up on the recommendations of the committee on this area was discussed at some length. The need for getting out a letter to the membership

advising all members of this action and soliciting their nominations for candidates for this award was discussed. It was agreed that such a letter should be gotten out in the near future and that Ackerman in consultation with James would proceed to develop and design a suitable citation.

4. Authorization to obtain cash for short-run operations of the Association. The fact that current cash balances were inadequate to carry through production of the proposed directory was apparent upon examination of the financial statement of the Association.

Trelogan moved that the Secretary-Treasurer of the Association be authorized to sell bonds or to borrow using Association bonds or stocks as security to realize funds in the amount needed up to $6,000 for current operation of the Association during fiscal year 1956-57. Carried.

5. Acquisition of needed capital items in the office of the Secretary. Ackerman moved approval of the purchase of additional membership files and minor capital items needed in the office of the Secretary-Treasurer. Carried.

AMERICAN FARM ECONOMIC ASSOCIATION BUDGET FOR 1956–57 AS ADOPTED BY EXECUTIVE COMMITTEE, AUGUST 28, 1956

	Actual Expenditures		Budgeted for	
	1954–55	1955–56	1955–56	1956–57
Income Item				
AFEA dues, subscriptions	$12,012.57	$18,149.59	$17,000	$20,000
Sale of back issues, JFE	454.55	588.30	950	800
Sale of reprints, JFE	806.05	869.47	800	800
Advertising, JFE	300.00	210.00	300	500
Sale of directories	—	—	—	1,500
Awards program	2,355.00	100.00	—	—
Interest	737.45	372.50	600	275
Dividends	2,699.72	2,744.02	2,800	2,800
Collected for Western FEA	1.50†	549.50†	—	—
Collected for Canadian AES	†	257.50†	—	—
Sale of membership lists, misc.	15.00	—	50	—
Capital depletion (sale of bonds)*	—	—	1,600	9,925
Total	$19,381.84	23,840.88	24,100	36,300
Expense Item				
Journal printing	15,334.96	18,296.85	18,000	20,000
Editing fees, JFE	934.00	1,262.00	1,100	1,400
Reprints, JFE	1,141.12	1,035.39	1,200	1,200
Purchase, back issues, JFE	592.00	54.00	50	400
Awards program expense	6,151.75	1,691.37	1,600	2,200
Annual meetings expenses*†	381.82†	1,671.32	900	2,000
Postage, telegrams, telephone	335.20	305.52	300	600
Office supplies, expenses	456.64	366.53	400	500
Directory, subscription refunds, misc.	65.01	724.61	120	8,000
WFEA dues transferred to WFEA	—	455.50†	—	—
CAES dues transferred to CAES	—	225.00†	—	—
Bad checks, non-par items	—	10.90	—	—
Total	$25,392.50	26,099.99	23,670	36,300
NET GAIN	−6,010.66	−2,259.11	430**	

* Entered with hope that sustaining memberships will yield an income of $10,000, thus prevent the necessity of depleting capital as budgeted here.

*† Shown on a net basis.

** To be allocated to Special Grants Fund as share of interest.

† Shown on a net basis in previous years.

6. Calendar year to be retained for Association. The possibility of shifting all operations of the Association to a fiscal or calendar year was discussed. It was agreed that the Association continue to operate as at present with acceptance of membership and subscription dues on a calendar year basis only. Fiscal affairs will be handled on a July 1 to June 30 basis as in previous years.

7. Continuance of Agricultural Data Committee. It was agreed that the Agricultural Data Committee should be continued another year.

8. Student section. It was agreed that the duties of the student section leadership be handled by Vice President John Timmons. Approval of annual expenditure of up to $75 for supplies and postage for the student newsletter, two issues per year, was given. Provision of funds for officer travel (President and Secretary of the student group) to annual meetings of the American Farm Economic Association was again discussed but no action was taken. It was agreed that President James should write to the various departments of agricultural economics throughout the country indicating that at the request of the Executive Committee of the Association, we were encouraging the various institution (states, colleges or other groups) to support financially the attendance and participation of undergraduate students at the annual meeting of AFEA. It was pointed out that many states do give financial support for student participation in livestock judging and related competition and activities and that with suitable encouragement institutions might also support attendance of debaters, public speakers and participants in the annual meeting of the student sections of the Farm Economic Association.

9. Employment committee. Continuance of the activities of this group as a valuable service at the annual meeting was recommended.

10. Policy with respect to *Journal* publication of proceedings at annual meetings. The ever-increasing length of volumes of the *Journal of Farm Economics* carrying proceedings of annual meetings was recognized and discussed at some length. The Executive Committee requested the Editor to exercise every reasonable precaution to cut the length of papers presented in these annual meetings that the size of the volume might be held within workable limit. He was encouraged to re-submit papers which were unduly long to the authors for more careful editing.

11. A total volume of the *Journal* for the ensuing year of around 1,500 pages was authorized. This was taken as a flexible target to be handled at the discretion of the Editor.

12. AFEA representative to the National Bureau of Economic Research. President Brandt reported that Editor Halcrow represented the Farm Economic Association in this capacity and Halcrow indicated his appreciation of this appointment and sought council of members with respect to any suggestions they may have for his activities in this group.

13. Association seal. Trelogan moved the approval of the new seal used for the first time in the 1956 meetings as the official seal of the Association. Carried.

14. Miscellaneous policy matters.

No action was taken on the suggestion that the American Farm Economic Association become a member of the International Economic Association.

The need for a full-time executive secretary of the Association was discussed. Although no action is required at this time, many felt that we wanted most to preserve the salient features of our organization as a professional group and that with a full-time salaried staff certain of the desired features in our present organization might not be retained.

It was agreed that members of the Association not in attendance at the California meetings should be provided with copies of the program for the meeting. Brandt will handle the distribution of programs to this group.

The responsibilities of the officers of the Association were reviewed. President-Elect Trelogan as traditionally has been the role of the President-Elect will handle the winter meeting activities of the Farm Economic Association in December, 1957. Vice President Timmons will handle the student group activities and Vice President Heisig has specific responsibilities in connection with the development of the program for the annual meeting in August, 1957.

Trelogan suggested that it would be desirable to recognize the contributors and the solicitors who contacted these contributors that made possible the awards program. It was suggested that the Chairman of the Awards Committee write an appropriate letter to contributors of record and to some of the solicitors making this work possible indicating our continued appreciation of their contributions.

15. The attached budget was developed and approved.

16. 1958 meeting place. Various sections of the country were discussed and President-Elect Trelogan assumed responsibility for bringing specific recommendation with respect to the 1958 meeting place to the meeting of the Executive Committee at Cleveland in December, 1956.

Adjourned.

MINUTES OF MEETING OF EXECUTIVE COMMITTEE, AMERICAN FARM ECONOMIC ASSOCIATION, STATLER HOTEL, DECEMBER 27, 1956

In attendance: James, Brandt, Ackerman, Heisig, Trelogan, Hardin and guests Campbell, Halcrow, Nicholls.

1. The current financial status of the Association was discussed. The committee supported the action of the Secretary in borrowing using bonds as security to the extent necessary. Hardin and Halcrow were requested to study Association policy on pricing *Journal* reprints. They were asked to report at the next meeting of the Executive Committee.

2. Progress and problems in the production of the Association's Who's Who Directory were discussed. Estimates of total costs ranging upward from $5,000 to $8,000 for 4,000 copies were presented. Brandt reported some progress in securing advertising revenue to offset some of the cost of producing that Directory. Typing and editing of the Directory should be complete by February 1.

3. 1958 meeting place. Professor Ralph Campbell, Vice President of the Canadian Agricultural Economics Society, personally presented an invitation for AFEA to meet jointly with the Canadian Society, at the University of Manitoba at Winnipeg in the summer of 1958. President-Elect Trelogan discussed alternative meeting places and invitations on hand. It was moved that the Association accept the Canadian invitation to meet in Winnipeg the summer of 1958. Carried. Also presented was an invitation from Dr. T. N. Hurd and others at Cornell University for the AFEA to meet there for the 50th Anniversary celebration and annual meeting in the summer of 1959. It was moved that our Executive Committee recommend to the incoming Executive Committee acceptance of the Cornell invitation for the summer of 1959. Carried.

4. Appropriate recognition of the 50th Anniversary of the Association through

production of a commemorative issue of the *Journal*, special programs, a brochure or other appropriate devices was discussed. It was moved that the President name a committee to prepare the suggested layout for a set of papers and an appropriate commemorative document dealing with the history of the Association and that this committee report at the August meeting. Carried.

5. Following discussion of the International Cooperative Administration proposal that the Association contract with that organization to serve agricultural economists in other parts of the world, it was moved: That the secretary was authorized to negotiate with ICA and sign a contract if in his judgment this was wise. Carried.

6. Brandt reported that the Advertising Committee had prepared and was distributing new information on rates for *Journal* advertising and that some response was forthcoming.

7. President James presented a letter from Mr. Townsend of the Iowa State College Press indicating that sales of the Association-sponsored book, READINGS ON AGRICULTURAL MARKETING, had been most disappointing. Fifteen hundred copies were produced of which 633 copies remain unsold at the end of the first three years. Under terms of the Association contract with the Iowa State College Press, the Association was to assume certain of the costs if the publication venture was unsuccessful. Mr. Townsend reported that the press had put $6,413 into the project to date from which the gross returns had thus far been only $3,388. Under the terms of the contract, the Association is now obliged to pay Iowa State College Press $846.76 toward their deficit of $3,025.34. It is understood that after the Association makes this payment, the Association will receive 75 cents royalty on each volume sold for $5. It was moved that the Secretary be authorized to pay Iowa State College Press the $846.76 called for in our contract and that various promotional opportunities be explored. Carried.

8. It was moved that Editor Harold Halcrow be requested to consider taking another three-year term as Editor of the Association's *Journal* on completion of his present term in December, 1957. Carried.

9. It was noted that the sustaining membership drive under the leadership of R. I. Nowell was getting under way.

10. The progress report of the Agricultural Data Committee under the chairmanship of Walter Ebling was filed and accepted with thanks.

11. The Association awards program is moving forward in 1957 under the continuing chairmanship of W. H. Nicholls with Vice President Timmons handling the student affairs including the student debate activities at the summer meeting.

12. President James announced that the Executive Committee would meet essentially all day Wednesday, August 28, preceding the start of the official annual meeting program that evening at Lake Junaluska. It was further noted that the Executive Committee might have to meet again on Saturday following the close of the meeting.

13. Considerable time was devoted to Executive Committee responsibilities attendant to the new program of selecting Fellows in the American Farm Economic Association.

14. It was noted that the Allied Social Science December meetings are now scheduled in future years as follows: December 28-30, 1957—Philadelphia; December 27-29, 1958—Chicago; December 28-30, 1959—Washington, D.C.; December 28-30, 1960—New Orleans; and 1961—New York.

LOWELL S. HARDIN, *Secretary-Treasurer*

INDEX TO VOLUME XXXVIII

1956

SUBJECTS

Advertising Effectiveness, Research on, 964
Advisory Committees, Research and Marketing, 1
Agricultural Administration and Research, Data Requirements in, 1452
Agricultural Data, Changing Requirements for,
Agricultural Data Requirements in Extension Work, 1446
Data Requirements in Agricultural Administration and Research, 1452
Local Data Requirements in Areas of High Agricultural Specialization, 1455
Discussion, 1468
Agricultural Data Requirements in Extension Work, 1446
Agricultural Data Requirements in Extension Work, Discussion, 1468
Agricultural Economic Problems, Application of Mathematical Programming to,
Programming Farm-Nonfarm Allocation of Farm Family Resources, 396
Application of Programming Analysis to Corn Belt Farms, 408
Solving Feed Problems Through Linear Programming, 420
Agricultural Economics in the Years Ahead, 1093
Agricultural Economists Abroad, Effective Cooperation With, 1235
Agricultural Policy Issues
Economic Implications of California Agricultural Marketing Problems, 1679
Canada's Price Support Policy and Its Performance, 1692
Shortcomings in Current Explanations of National Farm Surpluses, 1708
Discussion, 1716
Agricultural Problem, The, 1102
Agricultural Production, Output and Supply, Reflections on, 748
Agriculture, Equity Financing in, 1537
Agriculture in a Modern U. S. Tariff Policy, Role of, 320
Agriculture in the Nation's Economy, 223
Alabama Black Belt, 1875-1917, The Wholesale Commission Business in the, 799
Award-Winning Graduate Students' Contributed Papers
Fiscal Needs and Capacity of Connecticut Towns, 1475
Estimated Demand for Livestock Products at the Farm Level, 1483
Economic Considerations in the Design and Evaluation of Production Forecasts, 1492
Linear Programming—A New Approach to Interregional Competition in Dairying, 1501
Discussion, 1544

Butter Quality by Chemical and Flavor Tests, Measurement of, 113

California Agriculture, A Preview of, 1115
California Agriculture—Its Unique Features and Problems, 1107
California Agricultural Marketing Programs, Economic Implications of, 1679
California Agricultural Marketing Programs, Discussion: Economic Implications of, 1716
Canada's Interest in U. S. Tariff Policy, 333
Canada's Price Support Policy and Its Performance, 1692
Canada's Price Support Policy and Its Performance, Discussion:, 1719
Consumer Grades for Foods, On, 44
Consumer Preference Research, Discussion: New Techniques in, 1357
Consumer Preference Research, New Techniques in, 1335
Consumer Price Indexes? What Concepts Are Appropriate to, 361
Consumer Prices, A Critique of Federal Statistical Series: Index of
What Concepts Are Appropriate to Consumer Price Indexes?, 361

The Parity Index and the Farm Expenditure Survey, 369
BLS Consumers' Price Index and the AMS Index of Prices Paid by Farmers for Family Living—A Juxtaposition, 378
Discussion: The Need for an Expanded Price Research Program, 390
Discussion: A Critique of Federal Statistical Series: Index of Consumer Prices, 394
Consumer Prices, Discussion: A Critique of Federal Statistical Series: Index of, 394
Consumption of Food and Their Uses, Discussion: Studies of the, 1765
Consumption of Food and Their Uses, Studies of the, 1736
Costs of Rearing and Educating Farm Children, 144
Credit and Investment in Agriculture
Economic Considerations in Making Timber Loans, 1516
Financing Farm Adjustments, 1527
Equity Financing in Agriculture, 1537
Discussion, 1544

Dairy Farm, Economics of Restoring the Productive Capacity of a Run-Down, 837
Dairy Production, Isoquants, Isoclines and Economic Predictions in, 763
Deciduous Fruits, Demand and Quality References for, 1405
Demand Elasticity, Prices, and the Business Cycle, A Note on, 1056
Demand from Time Series Data—A Synthesis of Three Approaches, Measurement of Substitution in, 711

Earnings of Some White and Negro Farmers in the United States, A Comparative Analysis of the, 1375
Economic Growth and Agricultural Policy, Prospects for, 238
Economic Growth and Stability, Policies for, 1159
Economic Growth and Stability, Strategy for,
Panel Discussion, Strategy from the Standpoint of Agriculture, 1173
Economic Relationships, Discussion: Estimation of, 512
Economics of Growth and Stability in the United States, The
Growth and Stability in the General Economy, 1127
An Alternative Diagnosis of the Farm Problem, 1137
Discussion, 1152
Elasticities of Supply of Selected Agricultural Commodities, Estimates of the, 496
Elasticities of Supply of Selected Agricultural Commodities, Discussion: Estimation of the, 509
Equity Financing in Agriculture, 1537
Equity Financing in Agriculture, Discussion: 1551
Escape Clause, The, 316
Estimation of Economic Relationships
The Dynamics of the Onion Market, 475
Effects of Shocks and Errors in Estimation: An Empirical Comparison, 485
Estimates of the Elasticities of Supply of Selected Agricultural Commodities, 496
Discussion: Estimation of the Elasticities of Supply of Selected Agricultural Commodities, 509
Discussion: Estimation of Economic Relationships, 512

Family-Size Farms, An Analysis of the First Interim Report of the New House Subcommittee on, 998
Farm Adjustments, Discussion: Financing, 1547
Farm Adjustments, Financing, 1527
Farm and Farming Efficiency in Northeastern Nebraska, Size of, 803
Farm and Home Counseling, The Place of the Extension Specialist in, 74
Farm and Home Planning in Extension Education, Basic Logic in, 80
Farm Labor in Underdeveloped Economies, The Average and Marginal Product of, 780
Farm Management in the Decade Ahead, Discussion: Institutional Considerations in, 1315
Farm Management in the Decade Ahead, Institutional Considerations in, 1293
Farm Management Research in the Decade Ahead, Discussion: Policy Considerations in, 1301

Farm Management Research in the Decade Ahead, Policy Considerations in, 1301
Farm Management Research Programs in the Decade Ahead, A Framework for, 1285
Farm Mangement Research Programs in the Decade Ahead, Discussion: A Framework for, 1311
Farm Mangement Research in the United States: 1956-66, The Role of
A Framework for Farm Management Research Programs in the Decade Ahead, 1285
Institutional Considerations in Farm Management in the Decade Ahead, 1293
Policy Considerations in Farm Management Research in the Decade Ahead, 1301
Discussion, 1311
Farm Managerial Decision Process, Research on the Dynamics of the, 158
Farm Organization—New Possibilities for More Effective Farm Management Research, Experiments in, 174
Farm Problem, An Alternative Diagnosis of the, 1137
Farm Tenancy and Urbanization, Note on, 1043
Farm Woodland Enterprise, Economic Aspects of the, 901
Farming Lands in France, The Consolidation of, 911
Fiscal Needs and Capacity of Connecticut Towns, 1475
Food Consumption, Discussion: Some Problems Raised by the Official Statistics of American Per Capita, 1769
Food Consumption, Some Problems Raised by the Official Estimates of American Per Capita, 1747
Food Distribution Abroad, Developments in Self-Service, 348
Food Research
Major Current Problems in Nutrition Research, 1727
Studies of the Consumption of Food and Their Uses, 1736
Some Problems Raised by the Official Estimates of American Per Capita Food Consumption, 1747
Discussion, 1762
Food Retailing and Economic Growth, 356
Food Retailing, The Dynamics of
Movements in the Retail Distribution of Food in the U. S., 336
Developments in Self-Service Food Distribution Abroad, 348
Food Retailing and Economic Growth, 356
Forage Production for Grazing, Discussion: Use of Surveys in Economic Research in, 1633
Forage Production for Grazing, Use of Surveys in Economic Research in, 1617

Galbraith on Farm Policy, Professor, 171
Galbraith's Stinger, 1054
General Economy, Growth and Stability in the, 1127

Incomes in Agriculture, What to do About Low, 1385
Indifference Surface for Beef and Pork, A Partial, 102
Industrial Workers in Kingsport, Tennessee, Origins and Relation to Agriculture of, 828
Interregional Competition as Affected by Recent Developments, 1660
Interregional Competition as Affected by Recent Developments, Discussion: 1675
Irrigated Corn Response to Nitrogen, Functional Relationships for, 736
Israel, The Effect of Fixed and Variable Costs on Keeping High Producing Milk Cows in, 93

Labor Standards and Wages in Agriculture in Underdeveloped Countries, 540
Land Reform in the Republic of Korea, Outcome of, 1015
Land Tenure in Australia in Relation to Technical Advances and Closer Settlement, 458
Land Tenure in the Philippines, 465
Land Tenure Problems in Southern Europe, 448
Land Tenure Situation in Pakistan and India, Report on the, 438
Land Tenure Situation Around the World
Basic Elements in the World Land Tenure Problems, 430
Report on the Land Tenure Situation in Pakistan and India, 438
Land Tenure Problems in Southern Europe, 448

Land Tenure in Australia in Relation to Technical Advances and Closer Settlement, 458
Land Tenure in the Philippines, 465
Linear Programming—A New Approach to Interregional Competition in Dairying, 1501
Linear Programming, Solving Feed Problems Through, 420
Linear Programming with Variable Capital Restrictions, A Modified Simplex Solution for, 940
Linear Programming Worksheet, Computation of the R Column of the Simplex, 1058
Livestock numbers in New Zealand, 1920-1950, Economic Influences on, 860
Livestock Products at the Farm Level, Estimating Demand for, 1483
Local Data Requirements in Areas of High Agricultural Specialization, 1455
Local Data Requirements in Areas of High Agricultural Specialization, Discussion: 1471
Looseleaf Reference Book: A Suggested Extension Technique, The, 176
Low Incomes in Agriculture, Discussion: What to do About, 1401
Low Incomes in Agriculture, What to do About, 1385

Market Development Programs, The Case of United States Cotton, Discussion: Economic Bases for, 1346
Market Development Programs: The Case of United States Cotton, Economic Bases for, 1322
Market Reports, Improvement of Livestock and Grain, 154
Marketing Costs, Discussion: Salient Features of Rising, 1589
Marketing Costs, Salient Features of Rising, 1565
Marketing Efficiency, Toward a More Meaningful Concept of, 68
Marketing Extension and Competitive Structure, 597
Marketing Margin—Farmer's Share Concept, Alternate Approaches to the, 1573
Marketing Margin—Farmer's Share Concept, Discussion: Alternate Approaches to the, 1591
Marketing Price Spreads? What is Behind Widening
Economic Implications of Current Transportation Policy Recommendations, 1556
Salient Features of Rising Marketing Costs, 1565
Alternate Approaches to the Marketing Margin—Farmer's Share Concept, 1573
Discussion, 1585
Markets for Farm Products? Can We Expand
Economic Bases for Market Development Programs: The Case of United States Cotton, 1322
New Techniques in Consumer Preference Research, 1335
Research on Improved Merchandising of Agricultural Products, 1346
Discussion, 1354
Measurements of Economic Behavior Relationships, The Impact of the Choice of Model on, 570
Meat Packing, Discussion: The Economic Impact of Technology on, 1795
Meat Packing, The Economic Impact of Technology on, 1775
Merchandising of Agricultural Products, Discussion: Research on Improved, 1360
Merchandising of Agricultural Products, Research on Improved, 1346
Migration and Factor Adjustment in Lower Mississippi Valley Agriculture: 1940-50, 1024
Minimum Labor Standards in Factory Employment in Underdeveloped Areas, 513
Minimum Wage Regulation in Underdeveloped Countries, 546
Minimum Wages and Other Labor Standards in Agriculture Considered in Relation to Economic Growth in Underdeveloped Countries, 529
Minimum Wages and Other Labor Standards in Small-scale and Cottage Industries Considered in Relation to Economic Growth in Underdeveloped Countries, 521
Mixed Rations for Hogs, Free Choice Versus Least-Cost, 863
Movements in the Retail Distribution of Food in the U. S., 336
Multiple Enterprise Farms, Estimating Enterprise Production Functions from Input-Output Data on, 923

National Farm Surpluses, Discussion: Shortcomings in Current Explanations of, 1723
National Farm Surpluses, Shortcomings in Current Explanations of, 1708
Nomogram for Pricing Products Whose Relative Supplies Are Fixed by the Yields from a Parent Source, 857
Nonfarm Employment Information for Rural People, 813
Nutrition Research, Discussion: Major Current Problems in, 1762
Nutrition Research, Major Current Problems in, 1727

Onion Market, The Dynamics of the, 475
Oranges, Discussion: The Economic Impact of Technology on Farm Commodities: The Case of, 1798
Oranges, The Economic Impact of Technology on Farm Commodities: The Case of, 1779

Parity Index and the Farm Expenditure Survey, The, 369
Polish Agriculture, Ten Years of Communist Planning in, 792
Poor in Agriculture, The
  Some Myths of Southern Economic Growth: A Study of Comparative Growth Rates in the Manufacturing Economy of the 11 Southeastern States, 1363
  A Comparative Analysis of the Earnings of Some White and Negro Farmers in the United States, 1375
  What to do About Low Incomes in Agriculture, 1385
  Discussion, 1397
Postwar Family Expenditure Studies in Western Europe, 846
Predicting Hog Prices, 931
Price Analysis, Discussion: Research Methods in, 1437
Price Analysis, Research Methods in
  Demand and Quality References for Deciduous Fruits, 1405
  Some Economic Effects of Supporting Feed Grain Prices, 1415
  New Ideas and Methods for Price Research, 1427
  Discussion, 1437
Price Expectations, Plans and Decision Making Among Ohio Commercial Cattle Feeders, 126
Price Index and the AMS Index of Prices Paid by Farmers for Family Living —A Juxtaposition, BLS Consumers', 378
Price of Cattle? How well do Auctions Discover the, 30
Price Research, New Ideas and Methods for, 1427
Price Research Program, Discussion: The Need for an Expanded, 390
Price Support Programs and Interregional Competition, 1650
Price Support Programs and Interregional Competition, Discussion: 1673
Price Supports, Benefits Versus Costs of, 868
Production Forecasts, Economic Considerations in the Design and Evaluation of, 1492
Programming Analysis to Corn Belt Farms, Application of, 408
Programming Computations, Short Cuts in, 981
Programming Farm-Nonfarm Allocation of Farm Family Resources, 396
Programming Use of Range Resources, Discussion: Economic Concepts in Directing and Designing Research for, 1630
Programming Use of Range Resources, Economic Concepts in Directing and Designing Research for, 1604

Range Economics Research, Contributions of Economics in
  Use of Economics in Making Decisions Relating to Range Use, 1594
  Economic Concepts in Directing and Designing Research for Programming Use of Range Resources, 1604
  Use of Surveys in Economic Research in Forage Production for Grazing, 1617
  Discussion, 1626
Range Use, Discussion: Use of Resources in Making Decisions Relating to, 1626
Range Use, Use of Economics in Making Decisions Relating to, 1594
Regional Development and Trade
  The Effects of Industrial Development on Tennessee Valley Agriculture, 1900-1950, 1636
  Price Support Programs and Interregional Competition, 1650

Interregional Competition as Affected by Recent Developments, 1660
Discussion, 1670

Sex and Brand-Preference, 179
Shocks and Errors in Estimation: An Empirical Comparison, Effects of, 485
Slaughter Steers and Heifers, Estimating Yields and Grades of, 584
Southern Economic Growth: A Study of Comparative Growth Rates in the Manufacturing Economy of the 11 Southeastern States, Some Myths of, 1363
Southern Economic Growth, Discussion: Some Myths of, 1397
Southern Economic Growth, Some Myths of, 1363
Soviet Agriculture, Discussion: The Resources and Performance of, 296
Soviet Agricultural Policy After Stalin: Results and Prospects, 274
Soviet Agricultural Resources Reappraised, 258
Soviet Agriculture, The Resources and Performance of, 258
Soviet Agricultural Resources Reappraised, 258
Soviet Agricultural Policy After Stalin: Results and Prospects, 274
Eye-Witness Appraisal of Soviet Farming, 1955, 287
Discussion: The Resources and Performance of Soviet Agriculture, 296
Soviet Farming, 1955, Eye-Witness Appraisal of, 287
Social Security in Agriculture: A Preliminary Appraisal of Its Operation, Implications, and Emerging Problems, 17
Strawberries, Discussion: The Economic Impact of Technology on, 1801
Strawberries, The Economic Impact of Technology on, 1785
Subscalding Techniques in the Marketing of Turkeys, Economic Results of, 62
Supply Response in Late Spring Potatoes in California, Statistical Analysis of, 553
Supporting Feed Grain Prices, Some Economic Effects of, 1415

Tariff Policy for the U. S. A., A Strong, Rich Country
Introduction: Tariff Policy for the U.S.A., 309
The Escape Clause, 316
Role of Agriculture in a Modern U. S. Tariff Policy, 320
Tariff Policy—Hardship Cases and Reciprocal Benefits, 324
Tariff Policy for the U. S. A., A Strong, Rich Country, 329
Canada's Interest in U. S. Tariff Policy, 333
Teaching Economics in Colleges and Universities, 991
Technical Cooperation, A Review and Criticism of United States Participation in Agricultural Programs of, 1197
Technology of Farm Commodities: The Economic Impact of
The Economic Impact of Technology on Meat Packing, 1775
The Case of Oranges, 1779
The Economic Impact of Technology on Strawberries, 1785
Discussion, 1795
Timber Loans, Discussion: Economic Considerations in Making, 1527
Timber Loans, Economic Considerations in Making, 1516
Transportation Policy Recommendations, Discussion: Economic Implications of Current, 1585
Transportation Policy Recommendations, Economic Implications of Current, 1556

United States Technical Assistance to Foreign Agriculture
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), Area Section A, 1212
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, The Middle East), Area Section C, 1228

Values that Serve as Motivators to Consumer Purchases, Classification of, 956
Values? What Can A Research Man Say About, 8

Water Allocation Among Competing Uses and Users, Theoretical Considerations of, 1244
Water Allocation Among Competing Uses and Users, Discussion: Theoretical Considerations of, 1276
Water be Allocated by Competitive Prices? Can, 1259
Water Be Allocated by Competitive Prices? Discussion: Can, 1279
Water, Growing Demand for [Water]: Product and Cost Allocation
Theoretical Considerations of Water Allocation Among Competing Uses and Users, 1244
Can Water be Allocated by Competitive Prices? 1259
Economic Implications of the Partnership Policy in Water Resources Development, 1269
Discussion, 1276
Water Resources Development, Discussion: Economic Implications of the Partnership Policy in, 1282
Water Resources Development, Economic Implications of the Partnership Policy in, 1269
Water Policy, Questions for Designers of Future, 971
Weaners, Yearlings, or Twos, 603
West German Agriculture: A Review Note, The Income of, 1048
White and Negro Farmers in the United States, A Comparative Analysis of The Earnings of, 1375
White and Negro Farmers in the United States, Discussion: A Comparative Analysis of The Earnings of, 1398
World Food and Agricultural Potentialities, 250
World Land Tenure Problems, Basic Elements in the, 430

AUTHORS

Abbott, John C.
Economic Results of Subscalding Techniques in the Marketing of Turkeys, 62
Ackerman, Edward A.
Questions for Designers of Future Water Policy, 971
Adams, Thurston M.
Discussion: Economic Implications of California Agricultural Marketing Programs, 1716
Allbaugh, Leland G.
Discussion: A Comparative Analysis of White and Negro Farmers in the United States, 1398
Allin, Bushrod W.
Galbraith's Stinger, 1054
Almon, Clopper Jr.
Origins and Relation to Agriculture of Industrial Workers in Kingsport, Tennessee, 828
Applebaum, William
Developments in Self-Service Food Distribution Aboard, 348
Andrews, Fred C. and Feder, Ernest
Measurement of Butter Quality by Chemical and Flavor Tests, 113
Atchley, Frank M.
Alternate Approaches to the Marketing Margin—Farmer's Share Concept, 1573
Athearn, James L.
Price Expectations, Plans and Decision Making Among Ohio Commercial Cattle Feeders, 126

Babbar, M. M.
A Note on Aspects of Linear Programming Technique, 607
Bachman, K. L. and others
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Bachmura, Frank T.
Migration and Factor Adjustment in Lower Mississippi Valley Agriculture: 1940-50, 1024
Baker, C. B.
Discussion: Economic Concepts in Directing and Designing Research for Programming Use of Range Resources, 1630
Baker, J. A. and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Barlowe, Raleigh
Discussion: Can Water Be Allocated by Competitive Prices? 1279
Bartlett, Roland W.
See Reviews (Beal, George Max and Bakken, Henry H.), 889

Baumer, Elmer F.
See Reviews (*Regulations Affecting the Movement and Merchandising of Milk*), 198
Bayton, James A.
Discussion: New Techniques in Consumer Preference Research, 1357
Been, Richard
Discussion: Award-Winning Graduate Students' Contributed Papers, 1512
Bennett, M. K.
Some Problems Raised by the Official Estimates of American Per Capita Food Consumption, 1747
Beringer, Christoph
Discussion: Use of Surveys in Economic Research in Forage Production for Grazing, 1633
Beringer, Christoph
Estimating Enterprise Production Functions from Input-Output Data on Multiple Enterprise Farms, 923
Bishop, Charles E.
Application of Mathematical Programming to Agricultural Economic Problems, Programming Farm—Nonfarm Allocation of Farm Family Resources, 396
Bissell, Richard M. Jr.
Tariff Policy—Hardship Cases and Reciprocal Benefits, 324
Black, John D.
Agriculture in the Nation's Economy, 223
Black, John D.
Discussion: The Effects of Industrial Development on Tennessee Valley Agriculture, 1900-1950, 1670
Blackmore, John and others
Experiments in Farm Organization—New Possibilities for More Effective Farm Management Research, 174
Bloom, Solomon and others
Isoquants, Isoclines and Economic Predictions in Dairy Production, 763
Blosser, R. H.
Economics of Restoring the Productive Capacity of a Run-Down Dairy Farm, 837
Boger, L. L.
Discussion: Research Methods in Price Analysis, 1441
Boles, James N.
Short Cuts in Programming Computations, 981
Booth, E. J. R. and Judge, G. G.
The Impact of the Choice of Model on Measurements of Economic Behavior Relationships, 570
Brandow, G. E.
See Reviews (Wheeler, Richard G. and Black, John D.), 632
Branson, Robert E.
Discussion: The Economic Impact of Technology on Meat Packing, 1795
Bratton, C. A. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Brinegar, George K.
Discussion: Financing Farm Adjustments, 1547
Brinegar, George K.
Teaching Economics in Colleges and Universities, 991
Brown, Dorris D. and Claar, J. B.
Agricultural Data Requirements in Extension Work, 1446
Brown, William G.
Free Choice Versus Least-Cost Mixed Rations for Hogs, 863
Brownlee, O. H.
See Reviews (Goldsmith, Raymond W.), 201
Buck, J. L. and others
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Burk, Marguerite C.
Studies of the Consumption of Food and Their Uses, 1736
Burrows, Glenn L.
See Reviews (Federer, Walter T.), 882

Candler, Wilfred
A Modified Simplex Solution for Linear Programming with Variable Capital Restrictions, 940
Case, H. C. M. and others
Effective Cooperation with Agricultural Economists Aboard, 1235
Castle, E. N.
Discussion: A Framework for Farm Management Research Programs in the Decade Ahead, 1311
Cavert, Wm. L.
See Reviews (Bogue, Allan G.), 629
Ciriacy-Wantrup, S. V.
Policy Considerations in Farm Management Research in the Decade Ahead, 1301

Claar, J. B. and Brown, Dorris D.
Agricultural Data Requirements in Extension Work, 1446
Clark, Faith
See Reviews (Prais, S. J. and Houthakker, H. S.), 887
Clawson, Marion and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Clifton, Elliott S. and Jebe, Emil H.
Estimating Yields and Grades of Slaughter Steers and Heifers, 584
Coke, J. Earl
California Agriculture—Its Unique Features and Problems, 1107
Coles, Jessie V.
Discussion: Major Current Problems in Nutrition Research, 1762
Cox, Clifton B. and Luby, Patrick J.
Predicting Hog Prices, 931
Creek, C. R. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Crutchfield, James A.
See Reviews (Palamountain, Joseph Cornwall, Jr.), 884

Davis, C. C. (Moderator)
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Wilson, C. P. and Seltzer, R. E. (Rapporteurs)
Davis, Irving F., Jr.
Discussion: Theoretical Considerations of Water Allocation Among Competing Uses and Users, 1276
de Vries, Egbert
Labor Standards and Wages in Agriculture in Underdeveloped Countries, 540
Dickerman, M. B.
See Reviews (Dana, Samuel T.), 1075
Dillon, J. L. and McFarlane, G. C.
Using the Simplex Worksheet for Linear Programming, 622
Douglas, William O.
See Reviews (Parsons, Kenneth H. and others), 876
Ducoff, Louis J. and Maitland, Sheridan T.
Minimum Wages and Other Labor Standards in Agriculture Considered in Relation to Economic Growth in Underdeveloped Countries, 529
Due, Jean Mann
Postwar Family Expenditure Studies in Western Europe, 846
Duncan, Otis Dudley
Note on Farm Tenancy and Urbanization, 1043

Eggert, R. J.
Discussion: Alternate Approaches to the Marketing Margin—Farmer's Share Concept, 1591
Epp, A. W. and Ottoson, Howard W.
Size of Farm and Farming Efficiency in Northeastern Nebraska, 803
Ewing, J. A.
Discussion: Local Data Requirements in Areas of High Agricultural Specialization, 1471

Fabricant, Solomon
Growth and Stability in the General Economy, 1127
Farnsworth, Helen C.
Discussion: Canada's Price Support Policy and its Performance, 1719
Farris, Paul L.
Marketing Extension and Competitive Structure, 597
Feder, Ernest and Andrews, Fred C.
Measurement of Butter Quality by Chemical and Flavor Tests, 113
Ferguson, Eli
Economic Considerations in Making Timber Loans, 1516
Fienup, Darrell F.
Discussion: Some Problems Raised by the Official Statistics of American Per Capita Food Consumption, 1769
Fisher, John L.
Discussion: Price Support Programs and Interregional Competition, 1673
Fisher, Walter D.
See Reviews, (Hildreth, Clifford and Jarrett, F. G.), 193
Fitzgerald, Dennis A.
Tariff Policy for the U. S. A., A Strong, Rich Country, 329
Folz, William E.
Discussion: Interregional Competition as Affected by Recent Developments, 1675

Fouraker, Lawrence E.
A Note on Demand Elasticity, Prices, and the Business Cycle, 1056
Fox, K. A. and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Foytik, Jerry
Discussion: Research on Improved Merchandising of Agricultural Products, 1360
French, Burton L.
Functional Relationships for Irrigated Corn Response to Nitrogen, 736

Galbraith, J. K.
See Reviews (Benedict, Murray R.), 878
Garlock, Fred L.
Financing Farm Adjustments, 1527
Gates, Paul W.
See Reviews (Haystead, Ladd and Fite, Gilbert C.), 637
Gatty, Ronald
The Consolidation of Farming Lands in France, 911
Gislason, Conrad and Harrington, A. H.
Demand and Quality References for Deciduous Fruits, 1405
Godwin, Marshall R.
Research on Improved Merchandising of Agricultural Products, 1346
Goodman, Bernard
See Reviews (Kindleberger, Charles P.), 1071
Goodwin, Dorothy C.
Fiscal Needs and Capacity of Connecticut Towns, 1475
Griffith, Wendell H.
Major Current Problems in Nutrition Research, 1727

Halvorson, L. C. and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Hamilton, W. E. and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
Harrington, A. H. and Gislason, Conrad
Demand and Quality Preferences for Deciduous Fruits, 1405
Harris, Chauncy D.
Soviet Agricultural Resources Reappraised, 258
Heady, Earl O.
Basic Logic in Farm and Home Planning in Extension Education, 80
Heady, Earl O.
Economic Concepts in Directing and Designing Research for Programming Use of Range Resources, 1604
Heady, Earl O. and others
Isoquants, Isoclines and Economic Predictions in Dairy Production, 763
Helburn, Nicholas
See Reviews (Van Royen, William), 188
Hendrix, W. Elbert
What to do About Low Incomes in Agriculture, 1385
Hewes, L. I., Jr. and others
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Hicks, John W.
Sex and Brand-Preference, 179
Hirsch, Werner Z.
See Reviews (Gollnick, Heinz), 1079
Hohman, Elmo P.
Minimum Labor Standards in Factory Employment in Underdeveloped Areas, 513
Holton, Richard H.
Food Retailing and Economic Growth, 356
Hoos, Sidney
Economic Implications of California Agricultural Marketing Programs, 1679
Hopkin, John A.
Use of Economics in Making Decisions Relating to Range Use, 1594
Horne, M. K. Jr.
Economic Bases for Market Development Programs: The Case of United States Cotton, 1322
Howell, L. D.
Benefits Versus Costs of Price Supports, 868
Huffman, Roy E.
Economic Implications of the Partnership Policy in Water Resources Development, 1269
Humphrey, Don D.
The Escape Clause, 316

Jacobsen, Norman L. and others
Isoquants, Isoclines and Economic Predictions in Dairy Production, 763

James, H. B.
Agricultural Economics in the Years Ahead, 1093
Jebe, Emil H. and Clifton, Elliott S.
Estimating Yields and Grades of Slaughter Steers and Heifers, 584
John, M. E.
Classification of Values that Serve as Motivators to Consumer Purchases, 956
Johnson, D. Gale
Eye-Witness Appraisal of Soviet Farming, 1955, 287
Johnson, Glenn L.
More Ado About Sarles' Suppositions Regarding the Interstate Managerial Study, 621
Johnson, Glenn L. and Smith, Joel
A Rejoinder, 163
Johnson, S. E. and others
Effective Cooperation with Agricultural Economists Abroad, 1235
Johnson, Vernon C.
See Reviews (Krooss, Herman E.), 206
Jones, Lawrence A.
Discussion: Economic Considerations In Making Timber Loans, 1544
Jones, R. W. (Moderator)
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East), 1228
Yudelman, Montague and Hamilton, H. G. (Rapporteurs)
Jones, W. O. and others
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, The Middle East), 1228
Judge, G. G. and Booth, E. J. R.
The Impact of the Choice of Model on Measurements of Economic Behavior Relationships, 570

Kanel, Don
See Reviews *(Uses of Agricultural Surpluses to Finance Economic Development in Underdeveloped Countries, a Pilot Study in India)*, 634
Katzman, I.
Solving Feed Problems Through Linear Programming, 420
Kehrberg, Earl W.
A Framework for Farm Management Research Programs in the Decade Ahead, 1285
Keiser, Norman F.
An Analysis of the First Interim Report of the New House Subcommittee on Family-Size Farms, 998
Kellogg, Charles E.
World Food and Agricultural Potentialities, 250
Kiehl, Elmer R. and Rhodes, V. James
New Techniques in Consumer Preference Research, 1335
Kiehl, Elmer R. and Rhodes, V. James
On Consumer Grades for Foods, 44
Kindleberger, Charles P.
Introduction: Tariff Policy for the U. S. A., 309
King, Gordon A.
Discussion: Estimates of the Elasticities of Supply of Selected Agricultural Commodities, 509
King, Gordon A.
Some Economic Effects of Supporting Feed Grain Prices, 1415
King, Gordon A. and others
Measurement of Substitution in Demand from Time Series Data—A Synthesis of Three Approaches, 711
Kohls, R. L.
Toward a More Meaningful Concept of Marketing Efficiency, 68
Koizumi, Susumu and Suits, Daniel B.
The Dynamics of the Onion Market, 475
Kristjanson, Kristjan
Discussion: Economic Implications of the Partnership Policy in Water Resources Development, 1282
Kutish, L. John
See Reviews (Miller, Herman P.), 644

Ladd, George W.
Effects of Shocks and Errors in Estimation: An Empirical Comparison, 485
Larson, A. L.
Discussion: Some Myths of Southern Economic Growth, 1397
Learn, Elmer W.
Estimating Demand for Livestock Products at the Farm Level, 1483
Locklin, D. Philip
Economic Implications of Current Transportation Policy Recommendations, 1556
Lockwood, William W.
See Reviews (Hewes, Laurence I. Jr.), 885

Lowe, Yehuda
The Effect of Fixed and Variable Costs on Keeping High Producing Milk Cows in Israel, 93
Luby, Patrick J. and Cox, Clifton B.
Predicting Hog Prices, 931

Maitland, Sheridan T. and Ducoff, Louis J.
Minimum Wages and Other Labor Standards in Agriculture Considered in Relation to Economic Growth in Underdeveloped Countries, 529
Marsh, Donald B.
Canada's Interest in U. S. Tariff Policy, 333
Martin, Joe A.
Some Myths of Southern Economic Growth: A Study of Comparative Growth Rates in the Manufacturing Economy of the 11 Southeastern States, 1363
Martin, Lee R.
Report on the Land Tenure Situation in Pakistan and India, 438
Martin, L. R. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
McCorkle, Chester O. Jr. and Mundlak, Yair
Statistical Analysis of Supply Response in Late Spring Potatoes in California, 553
McDowell, A. M.
The Economic Impact of Technology on Strawberries, 1785
McFarlane, G. C. and Dillon, J. L.
Using the Simplex Worksheet for Linear Programming, 622
McPherson, W. K.
Can Water be Allocated by Competitive Prices? 1259
McPherson, W. K.
Improvement of Livestock and Grain Market Reports, 154
McPherson, W. K.
How Well Do Auctions Discover the Price of Cattle? 30
Mehren, George L.
Discussion: Shortcomings in Current Explanations of National Farm Surpluses, 1723
Meinken, Kenneth W. and others
Measurement of Substitution in Demand from Time Series Data–A Synthesis of Three Approaches, 711
Mellor, John W. and Stevens, Robert D.
The Average and Marginal Product of Farm Labor in Underdeveloped Economics, 780
Mighell, Ronald L.
See Reviews (Nicholls, William H.), 1062
Miller, Frank
Equity Financing in Agriculture, 1537
Miller, Jarvis E.
Discussion: Award-Winning Graduate Students' Contributed Papers, 1510
Miller, K. E.
The Economic Impact of Technology on Meat Packing, 1775
Miller, L. F. (Moderator)
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Johnston, B. F. and Christensen, R. P. (Rapporteurs)
Mintz, Jeanne S.
Minimum Wages and Other Labor Standards in Small-scale and Cottage Industries Considered in Relation to Economic Growth in Underdeveloped Countries, 521
Morrison, E. M.
Discussion: What to do About Low Incomes in Agriculture, 1401
Mosher, A. T.
A Review and Criticism of United States Participation in Agricultural Programs of Technical Cooperation, 1197
Motheral, Joe R.
Land Tenure in the Philippines, 465
Mueller, Robert W.
The Dynamics of Food Retailing Movements in the Retail Distribution of Food in the U. S., 336
Mundlak, Yair
Economic Considerations in the Design and Evaluation of Production Forecasts, 1492
Mundlak, Yair and McCorkle, Chester O., Jr.
Statistical Analysis of Supply Response in Late Spring Potatoes in California, 553

Nelson, Aaron G.
Discussion: Equity Financing in Agriculture, 1551
Nelson, Elroy
Interegional Competition as Affected by Recent Developments, 1660
Nerlove, Marc
Estimates of the Elasticities of Supply of Selected Agricultural Commodities, 496
Nicholls, William H.
The Effects of Industrial Development on Tennessee Valley Agriculture, 1900-50, 1636
Nybroten, Norman
See Reviews (Morgan, James N.), 214
Nybroten, Norman
A Nomogram for Pricing Products Whose Relative Supplies Are Fixed by the Yields from a Parent Source, 857

Ogren, Kenneth E.
Salient Features of Rising Marketing Costs, 1565
Ohm, Hans
Member Behavior and Optimal Pricing in Marketing Cooperatives, 613
O'Regan, W. G.
The Economic Impact of Technology on Farm Commodities: The Case of Oranges, 1779
Osgood, O. T. and others
Experiments in Farm Organization—New Possibilities for More Effective Farm Management Research, 174
Ottoson, Howard W. and Epp, A. W.
Size of Farm and Farming Efficiency in Northeastern Nebraska, 803

Paarlberg, Don
Shortcomings in Current Explanations of National Farm Surpluses, 1708
Pak, Ki Hyuk
Outcome of Land Reform in the Republic of Korea, 1015
Parsons, Kenneth H.
Basic Elements in the World Land Tenure Problems, 430
Penn, Raymond J.
See Reviews (*Water: The Yearbook of Agriculture, 1955*), 191
Plath, C. V.
Use of Surveys in Economic Research in Forage Production for Grazing, 1617
Puterbaugh, Horace L.
Computation of the R Column of the Simplex Linear Programming Worksheet, 1058

Raup, Philip M.
The Income Position of West German Agriculture: A Review Note, 1048
Redman, John C.
Economic Aspects of the Farm Woodland Enterprise, 901
Reed, A. D.
A Prevue of California Agriculture, 1115
Regan, Mark M.
See Reviews (Scott, Anthony), 204
Rhodes, V. James
See Reviews (Galbraith, John Kenneth and Holton, Richard H. and others), 640
Rhodes, V. James and Kiehl, Elmer R.
New Techniques in Consumer Preference Research, 1335
Rhodes, V. James and Kiehl, Elmer R.
On Consumer Grades for Foods, 44
Richardson, J. Henry
Minimum Wage Regulation in Underdeveloped Countries, 546
Riley, H. E.
Discussion: A Critique of Federal Statistical Series: Index of Consumer Prices, 394
Robert, S. A. Jr.
Discussion: Economic Bases for Market Development Programs, 1354
Robertson, L. S. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Rock, Robert C.
Discussion: The Economic Impact of Technology on Strawberries, 1801
Rojko, Anthony S. and others
Measurement of Substitution in Demand from Time Series Data—A Synthesis of Three Approaches, 711
Roskelley, R. W. and others
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East), 1228
Rowe, Harold B.
Prospects for Economic Growth and Agricultural Policy, 238
Rowe, James W.
Economic Influences on Livestock

Numbers in New Zealand, 1920-1950, 860
Ruttan, Vernon W.
See Reviews (Jackson, Elmo L.), 212
Saloutos, Theodore
See Reviews (Smith, Howard R.), 208
Sanders, Irwin T.
See Reviews (Zagoroff, S. D. and others), 196
Sarle, Charles F.
Comments on the Rejoinder, 167
Sarle, Charles F.
Research on Advertising Effectiveness, 964
Sarle, Charles F.
Research on the Dynamics of the Farm Managerial Decision Process, 158
Schiller, Otto
Discussion: The Resources and Performances of Soviet Agriculture, 296
Schnittker, John and others
Isoquants, Isoclines and Economic Predictions in Dairy Production, 763
Schultz, Theodore W.
An Alternative Diagnosis of the Farm Problem, 1137
Schultz, Theodore W.
Reflections on Agricultural Production, Output and Supply, 748
Schutz, Willard D.
Discussion: The Economic Impact of Technology on Farm Commodities: The Case of Oranges, 1798
Schwenger, Robert B.
See Reviews (Myrdal, Gunnar), 1066
Shaffer, James D.
The Looseleaf Reference Book: A Suggested Extension Technique, 176
Shepherd, Geoffrey
Discussion: Research Methods in Price Analysis, 1437
Shepherd, Geoffrey
What Can a Research Man Say About Values? 8
Shultis, Arthur and others
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East), 1228
Siegel, Irving H.
A Critique of Federal Statistical Series: Index of Consumer Prices What Concepts are Appropriate to Consumer Price Indexes? 361
Sisk, Glenn N.
The Wholesale Commission Business in the Alabama Black Belt, 1875-1917, 799
Smith, Eldon D.
Nonfarm Employment Information for Rural People, 813
Smith, Joel and Johnson, Glenn L.
A Rejoinder, 163
Smith, M. G. and others
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Smith, Stephen C.
See Reviews (Clapp, Gordon R.), 209
Snodgrass, Milton M.
Linear Programming—A New Approach to Interregional Competition in Dairying, 1501
Sorenson, Vernon L.
See Reviews (Hepner, Harry W.), 638
Sorenson, Vernon L.
Price Support Programs and Interregional Competition, 1650
Soth, Lauren K.
See Reviews (Wilcox, Walter W.), 1064
Southern, John H. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Staniforth, Sydney D.
Institutional Considerations in Farm Management in the Decade Ahead, 1293
Stanton, B. F.
See Reviews (Heady, Earl O. and others), 1068
Stauber, B. R.
The Parity Index and the Farm Expenditure Survey, 369
Stein, Herbert
Policies for Economic Growth and Stability, 1159
Stevens, Robert D. and Mellor, John W.
The Average and Marginal Product of Farm Labor in Underdeveloped Economics, 780
Stine, O. C.
Professor Galbraith on Farm Policy, 171
Strong, T. H.
Land Tenure in Australia in Relation to Technical Advances and Closer Settlement, 458
Suits, Daniel B. and Koizumi, Susumu
The Dynamics of the Onion Market, 475

Swanson, Earl R.
Application of Programming Analysis to Corn Belt Farms, 408

Tapp, Jesse W.
The Agricultural Problem, 1102
Tarver, James D.
Costs of Rearing and Educating Farm Children, 144
Teper, Lazare
BLS Consumers' Price Index and the AMS Index of Prices Paid by Farmers for Family Living—A Juxtaposition, 378
Thomas, Marion D.
Data Requirements in Agricultural Administration and Research, 1452
Thompson, W. H.
Discussion: Economic Implications of Current Transportation Policy Recommendations, 1585
Timmons, John F.
Theoretical Considerations of Water Allocation Among Competing Uses and Users, 1244
Tintner, Gerhard
Discussion: Estimation of Economic Relationships, 512
Tolley, George S.
See Reviews (Fox, Karl A. and Johnson, D. Gale), 1077
Tolley, George S.
Discussion: Use of Economics in Making Decisions Relating to Range Use, 1626
Toussaint, W. D.
See Reviews (Diesslin, Howard G.), 627
Touissaint, W. D.
See Reviews (Hansing, Frank D. and Gibson, W. L. Jr.), 628
Trelogan, Harry C.
Research and Marketing Advisory Committees, 1
Turner, A. H.
Canada's Price Support Policy and its Performance, 1692

Vanvig, Andrew
Discussion: Policy Considerations in Farm Management Research in the Decade Ahead, 1318
Vergara, Jose
Land Tenure Problems in Southern Europe, 448
Volin, Lazar
Soviet Agricultural Policy After Stalin: Results and Prospects, 274
Vrooman, C. W.
Weaners, Yearlings, or Twos, 603

Walster, H. L.
See Reviews (Morlan, Robert L.), 200
Waugh, Frederick V.
A Partial Indifference Surface for Beef and Pork, 102
Webb, Laura Mae
Discussion: The Need for an Expanded Price Research Program, 390
Weeks, Silas B.
The Place of the Extension Specialist in Farm and Home Counseling, 74
Weinschenck, Gunther
See Reviews (Roemer-Scheibe-Schmidt-Woermann Paul Parey), 1073
Wells, O. V. (Moderator)
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Clodius, Robert L. and Heisig, Carl P. (Rapporteurs)
Wells, O. V. and others
The Strategy for Economic Growth and Stability from the Standpoint of Agriculture, 1173
West, Vincent I.
Discussion: Salient Features of Rising Marketing Costs, 1589
Westcott, George W.
Discussion: Agricultural Data Requirements in Extension Work, 1468
Wilcox, E. C.
Local Data Requirements in Areas of High Agricultural Specialization, 1455
Willett, J. W.
A Comparative Analysis of the Earnings of Some White and Negro Farmers in the United States, 1375
Windmuller, John P.
Minimum Wages and Other Labor Standards Considered in Relation to Economic Growth in Underdeveloped Countries, 543
Witt, Lawrence W.
Role of Agriculture in a Modern U. S. Tariff Policy, 320
Witt, L. W. and others
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East), 1228
Wolf, A. F.

Discussion: Studies of the Consumption of Food and Their Uses, 1765
Wood, Garland P.
Discussion: Institutional Considerations in Farm Management in the Decade Ahead, 1315
Woodin, M. D. and others
Problems in High-Population, Low-Technology, Low-Income Countries (Asia, Excluding Japan), 1216
Woodworth, Roger and others
Experiments in Farm Organization—New Possibilities for More Effective Farm Management Research, 174
Working, E. J.
Discussion: Economics of Growth and Stabilization in the United States, 1152
Working, Holbrook
New Ideas and Methods for Price Research, 1427
Wright, K. T. and others
Problems in High-Population, High-Technology, Low-Income Countries (Parts of Western Europe and Japan), 1212
Wunderlich, Gene
Social Security in Agriculture: A Preliminary Appraisal of its Operation, Implications, and Emerging Problems, 17

Yorke, Leo C.
See Reviews (Ian Shannon), 642
Yudelman, Montague and others
Problems in Low-Population, Low-Technology, Low-Income Countries (Africa, Latin America, the Middle East), 1228

Zaglits, Oscar
See Reviews (The Political Economy of American Foreign Policy), 6
Zawadzki, Michal I.
Ten Years of Communist Planning in Polish Agriculture, 792

REVIEWS

(by author of publication)

Agricultural Surpluses to Finance Economic Development in Underdeveloped Countries, a Pilot Study in India, (Kanel, Don), 634

Beal, George Max and Bakken, *Fluid Milk Marketing* (Bartlett, Roland W.), 889
Benedict, Murray R., *Can We Solve the Farm Problem?* (Galbraith, J. K.), 878
Bogue, Allan G., *Money at Interest* (Cavert, Wm. L.), 629

Clapp, Gordon R., *The TVA,* (Smith, Stephen C.), 209

Dana, Samuel T., *Forest and Range Policy: Its Development in the United States* (Dickerman, M. B.), 1075
Depression, Policies to Combat, (papers by Fox, Karl A. and Johnson, D. Gale), (Tolley, George S.), 1077
Diesslin, Howard G., *Agricultural Equipment Financing* (Toussaint, W. D.), 627

Federer, Walter T., *Experimental Design* (Burrows, Glenn L.), 882
Foreign Policy, The Political Economy of American, (Zaglits, Oscar), 891

Galbraith, John Kenneth and Holton, Richard H., in collaboration with Robert E. Branson, Jean Ruth Robinson and Carolyn Shaw Bell, *Marketing Efficiency in Puerto Rico* (Rhodes, V. James), 640
Goldsmith, Raymond W., *A Study of Saving in the United States* (Brownlee, O. H.), 201
Gollnick, Heinz, *Die Nachfrage nach Nahrungsmitteln und ihre Abhaengigkeit von Preisund Einkommensaenderungen* (Hirsch, Werner Z.), 1079

Hansing, Frank D. and Gibson, W. L. Jr., *Becoming a Farm Owner, Is it More Difficult Today?* (Toussaint, W. D.), 628
Haystead, Ladd and Fite, Gilbert C., *The Agricultural Regions of the United States* (Gates, Paul W.), 637
Heady, Earl O., Johnson, Glenn L., and Hardin, Lowell S., *Resource Productivity, Returns to Scale, and Farm Size* (Stanton, B. F.), 1068

Hepner, Harry W., *Modern Marketing Dynamics and Management* (Sorenson, Vernon L.), 638

Hewes, Laurence I. Jr., *Japan—Land and Men. An Account of the Japanese Land Reform Program, 1945-51* (Lockwood, William W.), 885

Hildreth, Clifford and Jarrett, F. G., *A Statistical Study of Livestock Production and Marketing* (Fisher, Walter D.), 193

Jackson, Elmo L., *The Pricing of Cigarette Tobaccos* (Ruttan, Vernon W.), 212

Kindleberger, Charles P., *The Terms of Trade: A European Case Study* (Goodman, Bernard), 1071

Krooss, Herman E., *American Economic Development* (Johnson, Vernon C.), 206

Miller, Herman P., *Income of the American People* (Kutish, L. John), 644

Morgan, James N., *Consumer Economics,* (Nybroten, Norman), 214

Morlan, Robert L., *Political Prairie Fire—The Nonpartisan League* (Walster, H. L.), 200

Myrdal, Gunnar, *An International Economy* (Schwenger, Robert B.), 1066

Nicholls, William H. (Technical Director), *United States Agriculture: Perspectives and Prospects* (Mighell, Ronald L.), 1062

Palamountain, Joseph Cornwall, Jr., *The Politics of Distribution* (Crutchfield,, James A.), 884

Parsons, Kenneth H., Penn, Raymond J., and Raup, Philip M. *Land Tenure,* (Douglas, William O.), 876

Prais, S. J. and Houthakker, H. S., *The Analysis of Family Budgets, with an application to two British Surveys conducted in 1937-39 and their detailed results* (Clark, Faith), 887

Regulations Affecting the Movement and Merchandising of Milk (Baumer, Elmer F.), 198

Roemer-Scheibe-Schmidt-Woermann Paul Parey, *Wirtschaftslehre des Landbaus, Handbuch der Landwirtschaft* (Weinschenck, Gunther), 1073

Scott, Anthony, *Natural Resources: The Economics of Conservation* (Regan, Mark M.), 204

Shannon, Ian, *Rural Industries in the Australian Economy* (Yorke, Leo C.), 642

Smith, Howard R., *Economic History of the United States* (Saloutos, Theodore), 208

Van Royen, William, *Agricultural Resources of the World, Vol. 1 of Atlas of the World's Resources* (Helburn, Nicholas), 188

Water: The Yearbook of Agriculture, 1955 (Penn, Raymond J.), 191

Wheeler, Richard G. and Black, John D., *Planning for Successful Dairying in New England* (Brandow, G. E.), 632

Wilcox, Walter W., *Social Responsibility in Farm Leadership* (Soth, Lauren K.), 1064

Zagoroff, S. D., Vegh, Jeno, and Bilimovich, Alexander D., *The Agricultural Economy of the Danubian Countries, 1935-45* (Sanders, Irwin T.), 196

AWARDS FOR RESEARCH IN AGRICULTURAL ECONOMICS, 1956

Best Journal Article

George E. Brandow
Pennsylvania State University

"A Modified Compensatory Price Program for Agriculture," JOURNAL OF FARM ECONOMICS, November 1955.

Outstanding Ph.D. Theses

V. James Rhodes
University of Missouri

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Vanderbilt University

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North Carolina State College

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Marvin W. Kottke
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University of Connecticut

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Michigan State University

The Effects of the Price Support Program on the Dry Bean Industry in Michigan, Michigan Agri. Exp. Sta., Tech. Bul. 250, April 1955.

Kenneth W. Meinken
Rutgers University

Vernon W. Ruttan
Purdue University

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Earl O. Heady, John T. Pesek, and William G. Brown (Honorable Mention)
Iowa State College

Crop Response Surfaces and Economic Optima in Fertilizer Use, Iowa Agri. Exp. Sta. Research Bul., 424, March 1955.

Frederick D. Stocker
(Honorable Mention)
Production Economics Research Branch, Agricultural Research Service

The Impact of Federal Income Taxes on Farm People, ARS 43-11, July, 1955.

Graduate Students' Contributed Papers

Dorothy C. Goodwin
University of Connecticut

"Fiscal Needs and Capacity of Connecticut Towns," JOURNAL OF FARM ECONOMICS, this issue, pp. 1475-82.

Elmer W. Learn
Pennsylvania State University

"Estimating Demand for Livestock Products at the Farm Level," *Ibid*, pp. 1483-91.

Yair Mundlak
University of California

"Economic Considerations in the Design and Evaluation of Production Forecasts," *Ibid*, pp. 1492-1500.

Milton M. Snodgrass
Purdue University

"Linear Programming—A New Approach to Interregional Competition in Dairying," *Ibid*, pp. 1501-10.

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